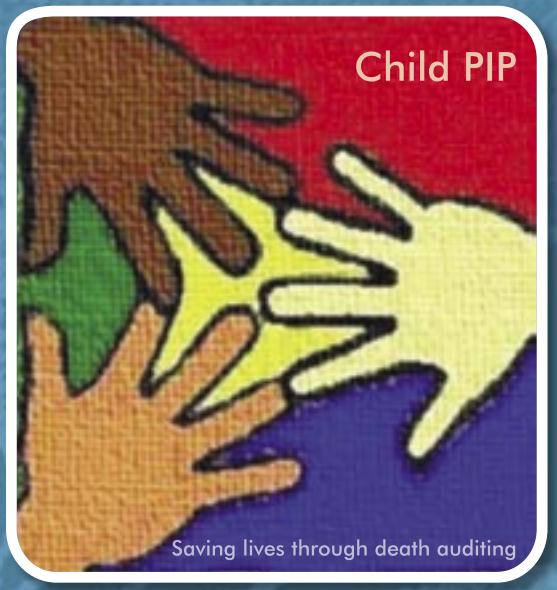


# SAVING CHILDREN 2004:

## A survey of child healthcare in South Africa

Compiled by:
The Child PIP Group and The MRC Research Unit for Maternal and Infant Health Care Strategies

ISBN No: 0-620-33837-7

University of Pretoria

CDC
Centers for Disease Control and Prevention

MRC

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# Saving Children 2004: A survey of child healthcare in South Africa

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A Krug, RC Pattinson

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| Free State province: Metsimaholo-Sasolburg Hospital | E Visser, WJ Steinberg |
| Gauteng province: Kalafong Hospital | MC Mulaudzi |
| KwaZulu-Natal province, Pietermaritzburg: Edendale, Grey's and Northdale Hospitals | C Stephen, H France, M Patrick, I Chuntarpursat |
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| Field-testing the U5PIP in 8 sites: Systems and processes | A Krug, RC Pattinson |

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## Child-PIP group

I Chuntarpursat, H France, S Frerich, JP Jooste, A Krug, E Malek, MC Mulaudzi, M Patrick, RC Pattinson, C Stephen, WJ Steinberg, E Visser, DL Woods.

## Foreword

As citizens and health care providers in South Africa we are duty-bound to enact the slogan 'First Call for Children'. This principle was laid down in 1990 by the largest gathering of world leaders in history at the World Summit for Children. As some 11 million children under the age of 5 years continue to die every year of preventable diseases, it would appear that this call is not commonly heeded by decision makers the world over. Statistics South Africa informs us that 95 under 5-year olds of every 1000 live births die in this country. It is generally accepted that this is an unacceptably high number, which cries out for attention.

It is thus laudable that a few committed health care providers have taken up the cudgel to establish the causes death of these children by means of the Under-5 healthcare Problem Identification Programme (U5PIP). This publication is of extreme importance, as it not only identifies the immediate causes of death, but also modifiable contributing factors at various levels. It is these factors that need to be addressed by the duty bearers at each identified level.

It comes as no surprise that the diseases, which are responsible for the majority of deaths, are the same as those named by the World Health Organisation and UNICEF in the early 1990's. They are readily preventable and, what is more, at no great cost. As mentioned in the publication, inexpensive treatment protocols and guidelines such as the Integrated Management of Childhood Illness and the Essential Drug List treatment guidelines are available.

A matter of great concern is the fact that some 70% of the deaths occurred in underweight children. In a country where there is an abundance of food, such as in South Africa, this cries out for in-depth and broad-based research.

When reflecting on the HIV-related data it comes as a sad reminder that in the case of children the disease is largely preventable. Hopefully the number of these deaths will drop appreciably, when the programme for the prevention of mother-to-child transmission of HIV becomes fully operational. However, it is a fact that even the uninfected child of an HIV-positive mother has a 3 – 4 times greater risk of dying before the fifth birthday, due to factors related to orphanhood.

It is anticipated that the Directorate of Child and Youth Health will incorporate the U5PIP type of intervention into its endeavour to improve the quality of care of children in first and second level hospitals. No doubt

in due course the number of contributors will increase beyond the few pioneers, to include doctors and nurses throughout the country. It should help to lift the morale of these health care providers when they participate in an intervention that focuses on their daily problems and which makes no attempt at witch-hunting.

The authors and editors of this publication need to be commended for conceptualising and initiating this valuable project, and on a shoestring budget at that.

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Paediatrician
National Department of Health

# Contents

## Saving Children: A survey of child healthcare in South Africa

## Executive Summary

This report gives findings from eight South African sites field-testing the Under-5 child healthcare Problem Identification Programme (U5PIP).

### Objectives

1. To assess whether this audit system is feasible and acceptable for different paediatric teams
2. To collect data on common causes of death and contributing conditions in children under-5 years
3. To determine health system failure, missed opportunities for intervention and substandard care relating to sick children
4. To test if the U5PIP modifiable factors are useful to identify problems in paediatric care
5. To obtain information on necessary changes and improvements to the U5PIP

### Settings

Eight sites (in 5 provinces) participated: Kalafong, Metsimaholo (Sasolburg), Witbank, Kimberley, Edendale, Northdale, Grey's hospitals and the following hospitals in Mafikeng region: Lehurutshe, Zeerust, Mafikeng Provincial, Thusong and Gelukspan.

### Methods

This study of under-5 child deaths used and tested the U5PIP. The sites were chosen to represent different levels of paediatric inpatient-care in five provinces. An initial workshop was conducted to train U5PIP-users to implement the programme at their hospitals. After the field-testing a feedback-workshop was held.

### Study period

1st September 2003 – 31st August 2004.

### Study population

All infants and children between the age of 1 month and 5 years admitted to the study hospitals during the study period served as denominator. All infants and children between the age of 1 month and 5 years who died in one of the study hospitals during the study period comprised the study group. Neonates have been excluded because neonatal deaths are audited with the Perinatal Problem Identification Programme.

## Results

During the study period there were 19695 admissions of children under 5 years and 1532 of these children died. The overall case fatality rate for under-5 admissions was 7.8%, (range 3.4% to 15%). The main causes of death were lower respiratory tract infections (33%), gastroenteritis (15%) and septicaemia (12%). Sixty percent of the deaths were HIV / AIDS related. Sixty-six percent occurred during the first year of life; 69% of children who died were underweight. Fifty percent died during the night and 31% died during the first 24 hours in hospital.

Administrative modifiable factors were present in 31% of the deaths, and in 26% clinical personnel related modifiable factors were detected at clinic level; in 33% at hospital admission; in 37% during hospital inpatient care.

The health workers at all sites want to continue using the U5PIP to evaluate and improve paediatric care. An upgraded programme should cover all paediatric deaths and have improved tools to analyse malnutrition and HIV-related deaths and modifiable factors.

## Key recommendations and conclusions

1. There is an urgent need to rapidly intensify the prevention of mother to child transmission programmes (including safe-infant feeding) and provide treatment for HIV infected women and children with antiretroviral therapy as indicated.
2. Attention needs to be refocused on detecting and managing childhood malnutrition effectively.
3. Further expansion, implementation and continued training of the Integrated Management of Childhood Illness (IMCI) programme is needed at primary care level.
4. Review, define and implement relevant standards for paediatric triage and inpatient care.
5. Sufficient numbers of appropriately trained staff must be available at all times.
6. Data collection must be accurate and complete, facilitated by improved ward registers, as well as medical records and archiving systems.
7. Quality assurance starting with outcomes audits, followed by process audits is essential to improve health care for children and should receive full support from health management.

# Chapter 1

## Why Children Die:
## Causes of under-5 child deaths and modifiable factors in paediatric healthcare in South Africa

### Introduction

*'The world's forgotten children'* was a Lancet editorial in 2003: "This year nearly 11 million children will die before they reach the age of 5 years. More than half of these children- roughly 6 million- will die of diseases that could have been easily prevented or treated".[1] It is surprising that child mortality does not receive more attention. South Africa is one of the 42 countries where 90% of the world's under-5 deaths take place. As the causes of child death differ substantially from one country to another, the expansion of understanding of child health epidemiology in South Africa is needed. It is necessary to determine why children die, so that interventions can be implemented effectively.

The estimated infant mortality rate for 2000 in South Africa was 60 per 1000 live births and the under-5 mortality rate 95 per 1000 live births.[2] The under-5 mortality rate and infant mortality rate (IMR) are basic health and development indicators. Infant and child mortality had decreased worldwide due to targeted primary healthcare and child health programmes, e.g. GOBI FFF. Due to the present HIV/AIDS epidemic infant and under-5 mortality rates are now rising.[2,3] Hospitals have an increased workload. Health workers are affected and infected by HIV/ AIDS, which further leads to deterioration of care. Although training programmes in less-developed countries have aimed at improving quality of healthcare, many of them have had little sustainable effect.[4]

Vital registration in South Africa greatly underestimates the number of deaths, and causes of death are often inaccurate; the lack of registration is worse in rural areas.[5] An important step to improve under-5-mortality data is to identify and classify all deaths occurring within the health system, especially in peripheral hospitals and clinics.[6] Although this will not give IMRs or under-5 mortality rates, it will be an important baseline and outcome measure for health services. As South Africa has ratified the Convention on the Rights of the Child, we are obliged to prioritise child survival and development. Thus regular reviews of child deaths in all healthcare facilities in South Africa are an important part of this process.[7]

The Under-5 child healthcare Problem Identification Programme (U5PIP) is a mortality audit system, which was developed in the Mafikeng region of the North West Province, during 2001.[8,9] It is used by doctors and nurses in

hospitals to identify common causes of under-5 deaths and to list modifiable factors in under-5 healthcare. It enables healthcare workers and managers to identify and then solve some of the problems.

This report summarizes field-testing the U5PIP in eight different sites in South Africa between 1/9/2003 and 31/8/2004. This chapter describes the findings on causes of death and the major modifiable factors in child healthcare. Recommendations based on the data were developed by the participants and are given at the end of the chapter.

## Methods

*Setting:* Eight sites participated in this field-testing. They included the paediatric wards in the following hospitals: Kalafong (Gauteng), Metsimaholo-Sasolburg (Free State), Witbank (Mpumalanga), Kimberley (Northern Cape), Edendale, Grey's, Northdale (all in Pietermaritzburg, KwaZulu-Natal) and the following hospitals in Mafikeng region (North-West Province): Lehurutshe, Zeerust, Mafikeng provincial, Thusong and Gelukspan.

*Study period:* 1 September 2003- 31 August 2004.

*Study population:* All infants and children between the age of 1 month and 5 years admitted to the participating hospitals during the study period. Neonates were excluded because neonatal deaths are already audited with the Perinatal Problem Identification Programme.[10] The *cases* were all infants and children between the age of 1 month and 5 years who died in one of the study hospitals during the study period.

This study of under-5 deaths used and tested the Under-5 child healthcare Problem Identification Programme (U5PIP).[8] The sites represent different levels of paediatric inpatient-care in five provinces in South Africa. Importantly, no central hospital was included, avoiding the biases of tertiary and quaternary academic hospitals. An initial workshop was conducted to train U5PIP-users to implement the programme at their hospitals. During and after the field-testing two feedback-workshops were held. The processes and methods used during the field-testing are described in the chapter "Field-testing the U5PIP in 8 sites: Systems and processes" of this report.

The field-testing included a prospective descriptive study of all under-5 deaths occurring in the study hospitals during the study period. The results of this study are presented in this chapter

*Cause of death classification*
U5PIP uses 48 categories of causes of death, which are ICD 10-based. One "main cause of death", three "other causes of death" and up to two "contributing conditions" can be entered. The "main cause" is the cause that probably led to the death of the child. "Other causes" are associated diagnoses or severe diseases, which were also present during the days before the child died. "Contributing conditions" are other health related problems in the child, which may or may not have had a causative link to the death.[8]

Children with HIV / AIDS were classified in the following way:[11]

1. AIDS: children, who clinically had AIDS according to the adapted WHO case definitions and had positive HIV-tests.
2. Clinically HIV-positive: children, who had symptomatic HIV-disease or clinically had AIDS, but could not be tested (In most of these cases the parents declined the test).
3. HIV-positive, tested and symptomatic: children who had symptomatic HIV-disease and had positive HIV-tests.

The classification of deaths of the U5PIP can be used in district or regional hospitals, where access to post mortems and microbiological investigations is limited.

*Standards and guidelines*
A precondition for audits is that health workers involved agree on standards and guidelines for the care they render. The U5PIP uses the South African Standard Treatment Guidelines for primary healthcare and for hospital paediatric care with local adaptations, the IMCI-guidelines and South African National norms and standards for equipment in district hospitals.[12, 13, 14,15] The performance of the health system was measured against these standards and thus substandard care could be identified and analysed.

*Modifiable factors*
The U5PIP guides health workers during the audit process to identify substandard care and missed opportunities for intervention, which are called "Modifiable factors". They are defined as events, actions or omissions contributing to the death or contributing to substandard care in a child who died, and which, by means of locally achievable interventions, can be modified. The list of Modifiable Factors contains the categories Family / Caregiver related problems, Administrative problems and Clinical Personnel related problems.[16] They are explained in the chapter on systems and processes in this report and attached in the appendix. During the audit a one-page data sheet per under-5 death was completed. It contains basic patient data from the patient's file and Road-to-health chart. The data was

entered into an Access database (Microsoft) and formed the basis for analysis.

Permission to conduct the development and piloting of the U5PIP was granted by the Ethics committee of the University of Pretoria and by the superintendents of the study hospitals.

## Results

*Age distribution*

Sixty-six percent of the under-5 deaths occurred during the first year of life. Neonatal deaths are excluded, because they are audited in another programme, the PPIP.

*Case fatality rates*

During the study period 1/9/03-29/2/04 the total number of medical under-5 admissions of the 8 sites was 19 695. The medical under-5 deaths that occurred within the health system were 1532. The overall case fatality rate (CFR) was 7.8%.

**Table 1.1. Basic data and case fatality rates (CFR) for the eight sites**

| | PMB | Maf | Kim | Mets | Kal | Wit | Total |
|---|---|---|---|---|---|---|---|
| Total number medical Under 5-admissions | 6190 | 4389 | 2400 | 841 | 3927 | 1948 | **19695** |
| **Total no. of medical Under 5-deaths** | **694** | **356** | **173** | **50** | **134** | **125** | **1532** |
| No. of deaths 1-12 months old | 449 | 238 | 107 | 40 | 84 | 93 | **1011** |
| **% of deaths 1-12 months old** | 65 | 67 | 62 | 80 | 63 | 74 | **66** |
| **CFR for all medical Under 5-admissions %** | **11.2** | **8.1** | **7.2** | **6.0** | **3.4** | **6.4** | **7.8** |
| No. of deaths underweight | 418 | 258 | 105 | 31 | 84 | 65 | **961** |
| **% of deaths underweight[1]** | 69 | 78 | 64 | 74 | 65 | 58 | **69** |
| No. severe malnutrition admissions | 311 | 398 | - | - | 154 | 94 | **957** |
| No. deaths with severe malnutrition ("main cause" or "other cause") | 187 | 99 | 46 | 17 | 38 | 36 | **423** |
| **CFR for severe malnutrition (%)** | **60** | **25** | **-** | **-** | **25** | **38** | **38[2]** |
| No. of LRTI admissions | 2035 | 1314 | - | - | 1114 | 693 | **5156** |
| No. of deaths with LRTI (main cause) | 211 | 97 | 53 | 27 | 56 | 57 | **501** |
| **CFR for LRTI (%)** | **10.4** | **7.4** | **-** | **-** | **5.0** | **8.2** | **8.2[2]** |
| No. of GE admissions | 1757 | 850 | - | - | 821 | 411 | **3839** |
| No. deaths with GE (main cause) | 130 | 41 | 22 | 10 | 16 | 7 | **226** |
| **CFR for GE (%)** | **7.4** | **4.8** | **-** | **-** | **2.0** | **1.7** | **5.0[2]** |

[1)] Denominator: U5-deaths with known weight [2)] Calculated for 6 sites with data
PMB – Pietermaritzburg (3 sites); Maf – Mafikeng Region; Kim – Kimberley; Mets – Metsimaholo-Sasolburg; Kal – Kalafong; Wit – Witbank.

**Table 1.2. Probable main causes of under-5 deaths in the eight sites**

| | No. of cases | % |
|---|---|---|
| Lower respiratory tract infection (LRTI) | 501 | 32.7 |
| Acute gastroenteritis (GE) | 226 | 14.8 |
| Septicaemia / possible serious bacterial infection | 186 | 12.1 |
| AIDS | 158 | 10.3 |
| Chronic diarrhoea | 65 | 4.2 |
| Bacterial meningitis | 62 | 4.0 |
| Severe malnutrition (Marasmus, kwashiorkor) | 43 | 2.8 |
| Respiratory failure | 42 | 2.7 |
| TB (pulmonary/ extra pulmonary) | 41 | 2.7 |
| Other infection/ inflammatory diseases of CNS | 18 | 1.2 |
| CCF/ pulmonary oedema | 16 | 1.0 |
| Congenital heart disease/ cardio myopathy | 16 | 1.0 |
| Liver failure | 13 | 0.8 |
| Hospital acquired infections | 10 | 0.7 |
| Hypoglycaemia | 7 | 0.5 |
| Digestive system, surgical | 5 | 0.3 |
| Pleural effusion, pneumothorax, pyothorax | 5 | 0.3 |
| Tumours, Leukaemia's | 4 | 0.3 |
| Croup | 4 | 0.3 |
| Inhalation of foreign body or gastric contents | 3 | 0.2 |
| Acute renal failure | 3 | 0.2 |
| Status epilepticus | 3 | 0.2 |
| Chronic renal disease | 1 | 0.1 |
| Myocarditis | 1 | 0.1 |
| Paraffin poisoning | 1 | 0.1 |
| Congenital infection (not HIV) | 1 | 0.1 |
| Accidents/ Drowning | 1 | 0.1 |
| Other diagnosis | 27 | 1.8 |
| Ill-defined/ unknown cause of mortality | 23 | 1.5 |
| No information | 46 | 3.0 |
| **Total** | **1532** | **100** |

## Other associated causes of under-5 deaths

In the U5PIP up to three "other causes of death" can be entered for each case, additional to the "main cause of death". The commonest in this study were severe malnutrition (24%), LRTI (21%), sepsis (15%), acute or chronic gastro enteritis (13%), AIDS (7.4%) and TB (7.4%).

## AIDS and HIV related deaths

Sixty percent of the under-5 deaths were HIV and AIDS related. The subcategories were as follows:

18 % clinical AIDS with a positive Elisa test

29 % symptomatic HIV infection with a positive Elisa test

13 % symptomatic HIV infection or clinical AIDS without a blood test.

**Mother's health**

Five percent of the children who died were orphans; in 12% the mothers were chronically ill. In many cases information about the mother's health was not available; this varied from 15% to 80% for the different sites.

**Prevalence of underweight and severe malnutrition**

The weight was known in 90% of the children who died. Sixty-nine percent of these children were underweight. Thirty percent of the all children who died had severe malnutrition (marasmus, kwashiorkor or marasmic kwashiorkor).

**Duration of hospital stay and time of death**

In 3% of cases the time of death was not known. In the cases with known time of death 50 % died after hours (18h00-6h59). Thirty-one percent died during the first 24 hrs of hospital stay.

**Staffing levels concerning doctors and levels of care**

Northdale Hospital provides level 1 care, Edendale levels 1 and 2 and Grey's levels 2 and 3 care. Witbank and Kimberley provide level 1 and 2 and some level 3 care. Kalafong provides levels 1, 2, 3 and some level 4 care. The level 4 care is paediatric oncology; the staff in the table above provides this specialized service too. In the Mafikeng Region Mafikeng provincial hospital provides level 1 and 2 care; and the other four hospitals provide mainly level 1 care, with some level 2 care.

**Modifiable factors - Lack of information**

In 19% of cases the RTH chart was not available for the audit meeting to analyse pre-hospital care; in 13% the notes were insufficient to comment on modifiable factors; 5% of the files were lost.

**Modifiable factors – Caregiver and family related**

In 21% no information about the care given by the family was available. In cases with information, modifiable factors related to delay in seeking healthcare were noted in 24%; in 6% the family declined to have an HIV-test done; and in 12% the caregiver did not realize the severity of the illness.

**Table 1.3. Staffing levels: Doctors for Under-5 inpatient care in seven sites[1] in South Africa**

| | Eden dale | North dale | Grey | Tot. PMB | Maf | Kim | Kal | Wit | Total |
|---|---|---|---|---|---|---|---|---|---|
| Total number medical Under 5-admissions | 2811 | 2702 | 677 | 6190 | 4389 | 2400 | 3927 | 1948 | 18854 |
| Total no. of medical Under 5-deaths | 415 | 200 | 79 | 694 | 356 | 173 | 134 | 125 | 1482 |
| **CFR for all medical Under 5-admissions (%)** | **14.8** | **7.4** | **11.7** | **11.2** | **8.1** | **7.2** | **3.4** | **6.4** | **7.9** |
| % of deaths underweight | 57 | 66 | 63 | 60 | 78 | 61 | 63 | 58 | 63 |
| CFR for severe malnutrition (%) | 53 | 92 | 53 | 60 | 25 | - | 25 | 32 | 44 |
| CFR for LRTI (%) | 14 | 7 | 6 | 10 | 7.4 | - | 5 | 8.2 | 8.2 |
| CFR for GE (%) | 10 | 6 | 4 | 7 | 4.8 | - | 2 | 1 | 5 |
| **No. of paediatricians fulltime** | 3 | 0 | 2 | 5 | 1 | 2 | 8 | 2 | *18* |
| **No. of paediatricians part-time[2]** | 3 | 0 | 1 | 4 | 1 | 2 | 0 | 0 | *7* |
| **No. of medical officers, registrars** | 5 | 3 | 4 | 12 | 3 | 4 | 14 | 4 | *37* |
| **No. of com serv drs** | 5 | 2 | 3 | 10 | 4 | 1 | | 2 | *17* |
| **No. of interns** | 6 | 5 | 2 | 13 | 1 | 1 | 8 | 3 | *26* |
| **U-5 admissions per Dr** | 141 | 270 | 60 | 150 | 472 | 279 | 131 | 177 | *188* |
| **U-5 adm per Dr excluding interns** | **201** | **540** | **73** | **219** | **529** | **316** | **178** | **244** | ***254*** |
| **U-5 adm per senior Dr (excl interns and CSD)** | 312 | 901 | 107 | 338 | 1021 | 364 | 178 | 325 | *329* |
| **U-5 adm per paediatrician** | **703** | **N/a** | **294** | **983** | **3376** | **923** | **491** | **974** | ***929*** |

1)No data from Metsimaholo-Sasolburg 2)Part-time paediatricians are calculated as 1/3
PMB – Pietermaritzburg (3 sites); Maf – Mafikeng Region; Kimb – Kimberley; Mets – Metsimaholo-Sasolburg; Kal – Kalafong; Wit – Witbank.

**Table 1.4. Modifiable factors- *Administrative problems* in under-5 deaths**

| | No. of cases | % (N = 1256*) |
|---|---|---|
| Transport problems | 41 | 3.3 |
| Lack of accessibility / Lack of health care facility / lack of beds | 61 | 4.9 |
| Lack of personnel / lack of appropriately trained personnel | 70 | 5.6 |
| Communication problems: staff – staff / staff - caregiver | 70 | 5.6 |
| Lack of drugs / IV solutions / Oxygen / blood products | 67 | 5.3 |
| Lack of equipment / equipment not functioning | 32 | 2.5 |
| Lack of food / milk | 25 | 2.0 |
| Other administrative modifiable factor (e.g. lack of policy) | 31 | 2.5 |
| No administrative modifiable factor identified | 868 | 69 |

* - N= 1256 assessable cases: Total 1532 deaths: 80 files lost; 196 cases with insufficient notes to comment on administrative modifiable factors.

**Table 1.5. Modifiable factors- *Clinical personnel related***

| ***Primary health care level*** (Total number of assessable cases = 1171. In 867 cases (74%) no modifiable factor at PHC level was identified) | **No. of entries*** |
|---|---|
| Insufficient case assessment | 117 |
| Insufficient case monitoring | 52 |
| Insufficient case management | 105 |
| Inappropriate use of RTH chart | 56 |
| Delay in referring acute problem | 54 |
| Delay in referring chronic problem | 68 |
| Other modifiable factor at PHC level | 26 |
| ***Hospital Admission and emergency care*** (Total number of assessable cases = 1423. In 957 cases (67%) no modifiable factor in hospital A and E care was identified)) | **No. of entries*** |
| Insufficient case assessment | 587 |
| Insufficient case monitoring | 222 |
| Insufficient case management | 269 |
| ***Hospital routine care and referral*** (Total number of assessable cases = 1388. In 878 cases (63%) no modifiable factor in hospital routine care was identified) | **No. of entries*** |
| Insufficient case assessment | 330 |
| Insufficient case monitoring | 184 |
| Insufficient case management | 153 |
| Delay in calling for senior opinion / referring | 64 |
| Inadequate IV fluids (prescription, recording or administered) | 230 |
| Inadequate feeding (prescription, recording or administered) | 70 |
| Other modifiable factor in hospital routine care / referral | 61 |

* *A case can have more than one modifiable factor in each section*

A table with more detailed findings is given in the Appendix 1.

## Discussion

To the study group's knowledge this is the first child healthcare survey of this type in South Africa. It may serve as a benchmark to compare the present situation with future developments.

This field-testing has a number of limitations. The data is largely hospital based; therefore it is not possible to comment on under-5 deaths occurring in the community, outside the health facilities. The inter-observer variability, when allocating causes of death and modifiable factors, is also not known.

The large sample size gives credibility to the findings. By excluding tertiary and quaternary academic hospitals, the study probably provides a fair reflection of the circumstances in sub-district, district and regional hospitals in the country. Most ill children are treated in these institutions and hence it is a reasonable starting point for surveying child healthcare in South Africa.

*Age distribution*
Of the 1532 under-five deaths, 66% occurred during the first year of life. Neonates were excluded. For comparison, this figure was 74% in the first U5PIP-pilot in Mafikeng region in 2001, and it is now 67% in the present survey in Mafikeng.[9] This study confirms others that found younger children to be at a higher risk of dying.[15,17]

*Case fatality rates and causes of death*
Table 1 shows *case fatality rates* (CFR) for all cases, for lower respiratory tract infections, gastroenteritis and severe malnutrition.

The overall CFR for the eight sites is 7.8%. The CFRs differ markedly between the study-hospitals, from 3.4% for Kalafong to 15% for Edendale. However, the patient population, referral and admission criteria and referral levels must be considered when comparing different hospitals' CFRs. The strength of the U5PIP is clear when monitoring one institution over time. U5PIP's value is less clear when comparing different hospitals . Similar hospitals need to be grouped together.
Once data has been verified and similar hospitals grouped, identification of hospitals with high and low case fatality rates is useful. The hospitals with low case fatality rates for a particular disease may have "presumed best practice". Comparisons can be made between the protocols and organisation of the "presumed best practice" hospitals with the other hospitals. This process can facilitate improvement of protocols and organisation at hospitals with high CFRs.

For example, how is the low CFR at Kalafong hospital explained? One factor at Kalafong is the programme for children with cancer and AIDS, which includes effective training and support, home-based care, and a hospice for the terminally ill. This means that children may receive good palliative care at home under acceptable circumstances, and the family is supported and chooses this option.

*Lower respiratory tract infections*

In the present study 33% of children died of lower respiratory tract infections (LRTI). LRTIs are a leading cause of death in children in developing countries worldwide.[15,17,18,19] For the year 2000, Black et al. estimated that 21% of all under-5 deaths are attributed to LRTI, and in half of these deaths undernutrition is an underlying cause of death.[20]

The CFRs for LRTIs vary between 5% and 14% for different hospitals. The denominator is "all under-5 patients admitted with LRTI". Major differences in CFRs may be explained partially by the fact that very busy hospitals only admit children with LRTI, if they are very sick, and thus bias the results. However, differences in case-management and the presence of modifiable factors in similar hospitals need to be investigated.

*Diarrhoeal diseases*

Acute gastroenteritis (GE) was the main cause of death in 15% of children in this study. For comparison, GE caused only 3.8% of under-5 deaths in Mafikeng region in 2001; this figure has now risen in Mafikeng to 11.5%.[9] In many regions a general decrease in diarrhoea-deaths and an increase in LRTI-deaths has been reported.[15,17,18,19]

The overall CFR for GE-admissions was 5%, ranging from 1.7% to 10%. The high CFRs in some hospitals are worrying, because gastroenteritis is a self-limiting condition, and high CFRs may show deterioration in homecare practices, in primary health care and in casualty case-management. CFRs for gastroenteritis, especially for children with normal weights, can be useful indicators for the quality of child healthcare at different levels.

*Septicaemia*

In 12% septicaemia was identified as main cause, in another 15% as associated cause of death. Infants with septicaemia may present with diarrhoea and vomiting and may be wrongly classified and treated for dehydration only. They need early diagnosis and effective treatment to improve the outcome.[15] The co-occurrence of two or more infectious diseases (e.g. LRTI, gastroenteritis and septicaemia) is common in

malnourished or HIV-positive children. This co-morbidity may result in synergism, leading to an increased risk of death.[20]

*Malnutrition*

In 10% of under-5 deaths the weight of the child was *not known*, which is a cause for serious concern regarding completeness of basic data collection in child healthcare.

Sixty-nine percent of the children who died were underweight; 30% had severe malnutrition. For comparison, severe malnutrition has increased in Mafikeng region from 22% in 2001 to 30% in 2003/4. Under nutrition is the most common underlying cause of child deaths associated with infectious diseases worldwide. Being underweight increases the case fatality rate for infectious diseases markedly. There is a synergistic effect on mortality, generating a rate of death that is greater than the sum of the two individual mortality rates.[20]

Case fatality rates for admissions with severe malnutrition are very high (25%-92%). However, these figures may not be accurate, because in many admissions severe malnutrition was not recorded as diagnosis in the ward register. Thus the denominator underestimates the number of children admitted and discharged, who had severe malnutrition, but were entered with other diagnoses, e.g. infectious diseases. Another problem is that many of the children with severe malnutrition who died also had severe symptomatic HIV-infection and thus a high risk of dying. The present U5PIP-software did not allow to determine how many of the underweight or severely malnourished children were also HIV positive, but this percentage is expected to be high.

*The Impact of HIV / AIDS*

In this study it is estimated that 60% of under-5 deaths were HIV-related. This shows the tremendous burden of HIV on the South African population.

As a comparison, the CFR for under-5 admissions in Mafikeng region has increased from 5.7% in 2001 to 8.1% in the present study.[9] This increase may be explained partially by the progressing HIV-epidemic. The overall CFR of the eight sites was similar (7.8%).

The WHO clinical classification for AIDS in children has a high specificity but a low sensitivity.[21,22,23] The prevalence of AIDS and symptomatic HIV-infection in this study may be underestimated. At present it is not possible to do PCR tests for suspected HIV-infection in most state hospitals; thus the estimates for AIDS and HIV-related deaths in infants lack accuracy. It

should be remembered that these deaths are within the health system and more children may die at home. Being symptomatic HIV-positive increases the case fatality rates for other infectious diseases in children markedly.[20] Bradshaw et al. estimated for the year 2000 that 40.3% of under-5 deaths were due to HIV/AIDS.[2]

To reduce the impact of the HIV epidemic on children, strategies aimed at preventing HIV-infection in young adults, preventing transmission from mother to child and treatment for HIV-infected mothers and children must be urgently implemented.

*Mothers' health*
Five percent of the children who died were orphans; in 12% the mothers were chronically ill; in almost half of the deaths we did not have information about the mother's health. In recent years, mortality among young adults, and particular in young women, has increased dramatically as a result of HIV/AIDS. This mortality and also the illness preceding it, has a devastating effect on children, leading to increased morbidity, mortality and orphanhood.[2]

## Problems in the health system

In weak health systems interventions of known benefit are not implemented effectively.[20] IMCI and WHO child health and treatment guidelines are effective in reducing child deaths.[24] The coverage of these interventions is unknown. Barriers to the implementation are also unknown. Audit of under-5 deaths and the identification of modifiable factors may identify barriers.

*Staffing levels concerning doctors and levels of care*
Staffing levels for doctors in Table 1.3 are estimates for the study period. More detailed analysis would be useful; e.g. the numbers of doctors working in neonatal services, who may not be available for general paediatric care. The services offered may differ markedly between different institutions. E.g. paediatric specialist care needed for children at Northdale hospital is provided at Grey's, whereas similar arrangements are not readily available in Mafikeng region. Children who are referred e.g. from Northdale to Edendale are those with more severe disease; thus the case fatality rates at level 2 or 3 hospitals are expected to be higher than at level 1.

Table 1.3 gives low case fatality rates for Kalafong, whereas those for Edendale are high. Both hospitals provide similar levels of care. One contributing factor to low CFRs at Kalafong may be the higher doctor to

patient ratio, especially for senior doctors. But one should also bear in mind the paediatric oncology services provided by Kalafong, which explains some of the additional staff. Staffing levels for nurses are not available and would contribute very important information.

Information on staffing levels in relation to patient numbers and other measures of workload must be monitored for each hospital over time. Thus increasing inequities will be identified and should be addressed. When comparing different hospitals, referral levels must be included in the analysis, and similar hospitals should be grouped together.

*Duration of hospital stay and time of death*

Thirty percent of children died during the first 24 hours in hospital. Investigation of the present triage and initial case-management in casualty or outpatient departments, where these children arrive is essential.[15] Equally important is information about home-care practices, pre-hospital care / PHC, transport problems and barriers when entering healthcare.

Fifty percent of deaths occurred during the night; an important administrative modifiable factor was the lack of professional nurses in paediatric wards during the night.

*Lack of information*

Five percent of files were missing. The lack of RTH-charts in the audit meetings (19%) and poor quality of clinical notes reduced the effectiveness of the audits markedly. When starting mortality audits in a hospital the initial finding may be that files are lost, not all deaths are identified, there are discrepancies between different registers (casualty, wards, mortuary) and that the *documentation of patient care is very poor*. This makes audits ineffective and leads to underestimation of deficiencies and modifiable factors in healthcare. However, the very identification of lack of RTH-charts, lost files and poor quality of clinical notes is an indication of problems in care of children. The problem is perhaps best expressed as "second class care for second-class citizens" and it is up to the managers to address that problem. Continued use of audit as an assessment tool, will show if the feedback from audit meetings is sufficient to improve record keeping, or if other interventions are needed. Initially the number of deaths may seem to rise, but in reality *all* deaths are now being identified and analysed.

When analysing modifiable factors the guiding principle is: "if it's not written, it's not done". The fact that all deaths are audited should be an encouragement for clinical personnel to improve record keeping.

*Caregiver and family related modifiable factors*
In 21% no information about the care given by the family was available. Delay in seeking healthcare was noted in 24% of cases; in 12% the caregiver did not realize the severity of the illness. Caregivers need education about when to bring a sick child to the clinic immediately. This information is part of the IMCI household and community component, which should be implemented urgently.[12] On the whole the cooperation with caregivers and families seems to be satisfactory, as also found in other studies.[9,25]

*Administrative modifiable factors*
Thirteen percent of cases lacked information; thus modifiable factors may have been underestimated. Thirty-one percent of cases with information had administrative modifiable factors. The most common administrative modifiable factors were communication problems (between staff or staff and the caregiver in 5.6% of cases), and lack of personnel (5.6%). Lack of personnel entailed lack of senior (post-community service) doctors and lack of professional nurses, especially during the night or weekends. Lack of drugs, oxygen, IV-solutions or blood products was present in 5.3% of cases. Transport problems were only noted in 3.3%.

*Clinical personnel related modifiable factors at PHC level*
In 26% of cases deficiencies were identified in clinical care at PHC level. The details are listed in Table 5. The main problems were case-assessment and case-management for LRTI and gastroenteritis and delayed referral for failure to thrive. Effective and sustained IMCI-implementation is needed. One problem about PHC-evaluation is that the data obtained was very incomplete (only 76% of cases had data on primary care).

*Hospital care: Clinical personnel related modifiable factors*
Table 1.5 shows that 33% of cases with information had deficiencies during admission or emergency care and 37% had deficient care in the ward. Case-assessment, monitoring, case-management and IV-fluids are areas of concern and need improvement.

The most common *monitoring problems* related to oxygen and glucose monitoring. The most common deficiencies in c*ase-assessment* occurred in shock and respiratory distress assessment and in physical examination of the patient. The most common *insufficient case-management* related to antibiotic prescription, oxygen therapy, and management of shock, dehydration and convulsions.

The high percentage of cases with modifiable factors in paediatric wards (37%) needs further explanation. Staffing levels, especially concerning

professional nurses and doctors with experience in paediatric care should be investigated, as they may be unacceptably low.

Discussing terminally ill children in *audit meetings* clarifies e.g. decisions and practical aspects of *palliative care*. The care rendered is compared with protocols and guidelines. The audit may show that necessary protocols and guidelines are missing. They must be relevant to patient needs and for the level of care rendered. They should strive for *optimal, locally achievable* care for the child and family in a holistic manner. This may lead to discharge of a terminally ill child, because the family wishes so. This includes effective pain treatment, relevant oral treatment e.g. for candidiasis and appropriate feeding.

Audit meetings were also used to discuss *referral criteria* and the communication with regional or tertiary hospitals.

## Conclusion

The pattern of diseases causing deaths in children under 5 years old is similar to those in other developing countries. However, as in most developing countries, many of these deaths should be preventable. Analysis of the modifiable factors indicates poor quality of care by health care providers at all levels. The reasons for this are not immediately clear, but lack of appropriate staff and lack of knowledge and skills are potentially major factors.

The impact of the HIV epidemic on children is apparent to all. The HIV epidemic must be controlled and reversed as an absolute priority.

It should be an encouragement for all involved in paediatric care, to review work performed regularly and detect how much can be improved using the present resources wisely and to prioritise and motivate effectively for essential additional resources. This is not for self-gratification but for the weakest members of our society, the sick children.

# Chapter 2

## Recommendations

The data shows that many children in South Africa die of preventable causes. The interventions that are effective in improving child survival are known, yet they are not being delivered to mothers and children who need them most. Many countries report that the gap between what *can* be done to reduce child mortality and what *is actually being done* is growing.[24,38] The reasons for the inability to improve coverage of effective interventions, especially among the economically disadvantaged need to be identified and rectified.

When South Africa adopted the Constitution and ratified the Convention of the Rights of the Child, all of us agreed to put children first. Children must be the top priority and children's rights to survival and development should be respected, promoted and protected.[7] Bryce et al., suggest that we do know effective biological or behavioural interventions, but we often do not know effective *delivery strategies* for the communities we serve.[24] This report helps to identify where healthcare for children is lacking, where improvement is possible and necessary, and where more information is needed.

In suggesting solutions to the challenges identified, the study group was guided by the findings of the survey and by the following questions: What must be done? - By whom? - Where? We did not ask the question "When?" because we know that the name of every sick child is "Today"!

### 1. HIV/ AIDS

- The PMTCT-programmes (including safe-infant feeding) must be intensified and evaluated, to reduce paediatric HIV-infection.
- All pregnant mothers and children with low CD4 counts should have access to ART as a matter of urgency
- Palliative care and home-based care programmes for sick children should be increased and strengthened. Mothers and other caregivers of sick children should be trained and supported.
- The U5PIP / Child PIP findings can be used to monitor trends in the child HIV epidemic

**Motivation.** HIV infection was involved in **three of every five** children who died. That is possibly an underestimate. Five percent of the children were orphans, and at least 12% of the mothers were chronically ill. This calls for urgent intervention with treatment of

mothers with AIDS and active measures to bring these children into the child grant system

**Suggested strategies**

- Strengthen, intensify and expand PMTCT, ARV and home based care programmes by means of increased resource allocation from different levels of government, NGOs and other funding.
- Evaluate and analyse the existing programmes. Academic and research institutions and NGOs could assist in this. The analysis should impact on further development of HIV related programmes.
- Make one PCR test (or CD4 count or viral load) available to all infants of HIV-positive mothers between 6 and 20 weeks of age (or 6 weeks after weaning in breastfed infants) to reach a diagnosis. The advantages are: (a) Effective case-management (b) Accurate data on vertical transmission and thus better evaluation of the PMTCT programmes, which would allow to identify and remedy problems in the present PMTCT programmes. (c) More effective counselling, especially around safe infant feeding.
- A national identification code should be determined and put on the infant's RTH-chart to identify infants of HIV-positive mothers who were on the PMTCT programme.

## 2. Severe malnutrition

- Underweight children need to be identified at the PHC level earlier, fully assessed according to IMCI protocol and if necessary referred.
- Underweight children need to be enrolled in effective feeding programmes and monitored.
- Poverty alleviation programmes need to be increased and health workers should be informed regularly on how caregivers can access them

**Motivation.** More than two-thirds of the children who died were underweight, and just under half of these were severely malnourished. The case fatality rate of severely malnourished children was 44%.
Even if the majority of underweight children were HIV-positive, their survival can be extended and quality of life significantly improved by better feeding and by treating other infections, especially TB, and they need to be considered for ART.

**Suggested strategy**

- The 10 steps for the case-management of severe malnutrition should be taught, implemented and monitored in all hospitals as a matter of urgency

## 3. Primary healthcare level

- Strengthen IMCI training, implementation and supervision for IMCI-trained nurses
- Strengthen the implementation of the IMCI household and community component to improve homecare practices
- Monitor gastroenteritis morbidity and mortality in clinics and hospitals

**Motivation.** Substandard care at the primary care level was present in one in four cases that could be assessed. Adherence to the IMCI protocols would have prevented this.

Information about primary care or pre-hospital care rendered to children who died was limited, because many Road To Health Charts (RTHCs) were missing, and the participation of PHC staff in audit meetings was limited.

**Suggested strategies**

- IMCI is the designated strategy for improving the care of sick children, especially at primary care level. Resources need to be made available for continuous training and supervision. Attrition of trained nurses needs to be curbed.
- U5PIP information can help to analyse the coverage of IMCI interventions. Gastroenteritis morbidity and mortality may be a marker for this, because homecare practices (breast feeding, oral rehydration therapy) and effective early diagnosis and treatment at PHC level influence it.
- The U5PIP process will only have impact on PHC if RTHCs are available at audit meetings and if PHC staff attends. Communication and cooperation between the main sub-district hospital and the clinics needs to be improved. The audit process may help to achieve this.

## 4. Paediatric case management at hospital level

- Review, define and implement standards for paediatric triage in casualty / OPD
- Review, define and implement standards for level 1 and 2 paediatric hospital care.

- Improve case-assessment and case-management of lower respiratory tract infections, gastroenteritis, sepsis, paediatric AIDS, TB and meningitis
- Focus on oxygen monitoring and oxygen therapy, glucose monitoring, shock, IV fluids and appropriate antibiotic prescribing

**Motivation.** Substandard care was present in one in three assessable cases at casualty or outpatient departments and in two of every five assessable cases in hospital wards.

**Suggested strategies**

- Standards, which are helpful and widely used are the WHO manual "Management of the child with a serious infection or severe malnutrition", the South African "EDP Standard Treatment Guidelines, Hospital Level Paediatrics" (2004), the "Handbook of Paediatrics" by Heese (Oxford 1999) and "Paediatrics and Child Health" by Coovadia and Wittenberg (2004).
- However, standards can only be implemented, if a *core-team* of professional nurses and senior doctors with relevant training and experience are stabilised in and dedicated to paediatric wards.
- Obstacles to the implementation of standards and treatment guidelines should be investigated and monitored. The U5PIP may help in this regard.

## 5. Human resources

- Staffing levels for health professionals for different levels of paediatric inpatient care need to be defined and implemented as national standards for sub-district, district and regional hospitals. They require regular monitoring.
- Understaffed hospitals need to prioritise the filling of vacant doctors' and nurses' posts
- Paediatric wards need stable non-rotating professional nurses during the day and night.
- Doctors receiving sick children in casualty or working in paediatric wards need back up by senior doctors with paediatric experience.
- The growing HIV-epidemic makes additional human and other resources for paediatric inpatient care an urgent necessity.
- Regular *in-service training* for nurses and doctors from the hospitals and the district should be guided by findings from the U5PIP.

**Motivation**

Even with effective ART the need for more paediatric beds will not be reduced over the next years.

Patient monitoring, treatment, feeding and the management of IV-fluids in paediatric wards need specialised and continuous attention and supervision, by stable and experienced staff. This is necessary to improve paediatric case management at hospital level. Deficiencies in patient monitoring were identified in one out of four cases. Problems with IV-fluids were present in 17%; feeding problems were identified in 5% (and may be under-reported).

The main killers of under-5 children are HIV & AIDS, LRTI, gastroenteritis, sepsis and severe malnutrition. Effective prevention strategies or case-management protocols for these conditions are well known. Deficient paediatric case assessment or case management was present in 37% of cases. Staff shortages may have been under-reported in the present U5PIP study; however, they were documented in 6% of cases. Problems identified were the lack of professional nurses during the night and lack of senior doctors as back up for juniors.

Staffing levels and case fatality rates in this study show wide discrepancies between different institutions; further analysis is needed to understand how these relate to each other. Thus inequities in child health care may be identified and addressed.

**Suggested strategies**

- Improving staffing may necessitate that paediatric inpatient care be concentrated in *one main hospital* per sub-district (population of 140 000 -300 000), to make sufficient numbers of professional nurses and senior doctors available.
- Lodger mother units should be available in hospitals that offer paediatric inpatient care. This will improve feeding and monitoring of sick children, and provide love and reassurance.
- Effective and sustained strategies to attract and retain senior health workers for paediatric wards need to be identified and implemented urgently

## 6. Data collection and death audit

- Paediatric ward registers need to be updated and standardised to serve the information and registration needs of South African paediatric wards in the 21st century. The sister and doctor in charge of the ward must check the register daily.
- The RTHCs and other valuable documents on pre-hospital care should be copied and kept in the child's file

- Every paediatric death in a hospital or clinic or in an ambulance must be identified and entered into the death register and into the monthly tally sheet. This must be compared with the mortuary register.
- The paediatric admission form needs to contain the information, which is necessary to fill in the patient information on the death data capture sheet
- The primary caregiver should be interviewed about the health care the child received before coming to hospital.
- All paediatric deaths occurring in the health care system should be audited, preferably in audit meetings. Deaths on arrival need to be included where feasible
- All health workers involved in paediatric care and relevant health managers need to receive regular feedback from the audit findings

**Motivation**

Accurate and complete data are necessary to monitor and evaluate health care. If we do not know where we are, we cannot say where we want to go or where we are going. We cannot plan or implement without reliable data.

The present study shows a huge lack of information about sick children in hospitals:

- For children admitted and discharged it was not known, if these children were underweight or not.
- In 10% of deaths the weight of the child was not known.
- In 18% of deaths no RTHCs were available; in 23% of the deaths there was no information about pre-hospital care.
- In two children out of five who died it was unknown if the mother was dead, alive or sick.
- In 14% of cases it was not possible to comment on the care given due to lack of notes. U5PIP will show problems and modifiable factors in hospitals more accurately and completely if patient records reflect the care given and the circumstances of this care.

**Suggested strategies**

- Paediatric mortality audits need to receive full support from all relevant health managers. The audit should be ongoing and aim at completing the audit cycle.
- The new Child PIP should be developed. Training and implementation of the Child PIP needs to be supported by the National and the Provincial Health Departments.

- Child PIP helps managers to detect if the right things are being done. The focus is not to find faults but to identify and then solve problems.
- Hospitals that are not yet ready for the full paediatric mortality audit need to collect essential monthly data on paediatric inpatients. The Provincial Child Health Directorates need to compile and analyze these data. It needs to be noted that hospitals that participate in audits generally provide a better quality of care than those that do not. Thus those that do not yet participate in audits may have even bigger problems.

***We must do better!***

Child PIP can help us to put knowledge into action to reduce preventable child deaths. It will show us if we are going in the right direction. It can also show us where paediatric health care in South Africa lacks equity. Many interventions needed are attainable with current human and infrastructural resources and not expensive to implement. Let us also look at institutions identified with "presumed best practice", where the interventions are working well. Can we study the recipe for success and translate it into strategies for other health facilities or programmes?

We in South Africa have ratified the UN Convention of the Rights of the Child are committed to provide the highest quality of care for our children.

***"There can be no keener revelation of a society's soul than the way in which it treats its children".***

Nelson Mandela in summary of the first year of the Nelson Mandela Children's Fund 1996
http://www.web.co.za/mandela/children)

# Chapter 3.1

## U5PIP in Metsimaholo-Sasolburg Hospital, Free State

### Introduction

The U5PIP (Under-5 healthcare Problem Identification Program) is an audit system usable by medical officers and nursing teams in peripheral (rural) hospitals. It was field-tested at Metsimaholo Hospital between 1/9/2003 and 31/8/2004.

Metsimaholo Hospital is a rural hospital situated in the Northern District of the Free State province and serves a population of 116 000. (11 800 under 5 children) Seven provincial clinics (including 3 mobile clinics) are situated in the nearby town of Sasolburg. Metsimaholo is an 82-bed hospital with 6 medical officers, 3 community service doctors and 1 session doctor. Admissions of children under-5 years range between 42 and 80 per month. No paediatrician is available full- or part-time.

### Basic data

The total number of medical under-5 admissions for the period September 2003 – August 2004 was 841, of which 50 were fatal. Thus the case fatality rate was 5.9% (6.7% for the first of these 6 months and 5.2% for the second of the six months). Sixty-two percent of the deaths occurred in underweight children. In 16% of the deaths the weight was unknown. Seventy-eight percent of the deaths occurred in the age group 1 to 12 months; the highest number of deaths occurred between 2 and 3 months.

The U5PIP principle was introduced to the management of Metsimaholo Hospital in September 2003. Since then monthly audit meetings were held. The doctor responsible for IMCI in the province (the author of this report) came from Bloemfontein to conduct the meetings. The training coordinator, the sister in charge of Metsimaholo Hospital and the IMCI coordinator of the district attended the meetings. From time to time nursing personnel from casualty and from the maternity ward joined the meetings. Attendance by medical officers was limited and sporadic due to other responsibilities in the hospital.

### Key findings

Table 3.1.1 lists the probable main causes of death.

**Table 3.1.1 Probable main causes of under-5 deaths**

| | No. of cases | *% of total* |
|---|---|---|
| Lower respiratory tract infection (LRTI) | 27 | *54* |
| Acute gastroenteritis (GE) | 10 | *20* |
| AIDS | 4 | *8* |
| Septicaemia | 4 | *8* |
| Other | 5 | *10* |
| **Total** | **50** | ***100*** |

**Other causes of under-5 deaths**
Other, associated causes of deaths entered were kwashiorkor and marasmus in 10 cases (20%) and AIDS in 5 cases. Acute and chronic diarrhoea was noted in 10 cases.

**AIDS and HIV related deaths**
Twelve deaths (24%) were caused by AIDS and 17 (34%) had symptomatic HIV infection although no test was done or no test result was recorded.
This gives a total of 29 HIV and AIDS related deaths (58%).

**Mother's health**
In most cases (80%) it was retrospectively unknown what the condition of the mother was. One child was an orphan and 33 were known still to have a mother alive; two children had mothers who were chronically ill.

**Prevalence of underweight, severe malnutrition and hypoglycaemia**
In 31 of the 42 cases with known weights (74%), underweight was present. In 17 cases (40% of children with known weight) severe malnutrition was recorded. In one of the 50 cases hypoglycaemia was detected.

**Duration of hospital stay and time of death**
Most of the under-5 children, who died, had been in hospital between 1-3 days (52%). Twelve percent had a hospital stay of only 9 – 24 hours. Only one death occurred after 7 days in hospital.
Twenty-six deaths (52%) occurred between 07h00 – 18h00. Thirteen deaths (26%) occurred between 18h00 – 24h00 and eleven deaths (22%) between 24h00 – 07h00.

**Modifiable factors - Lack of information**
The main problems identified were:

- Insufficient notes to comment: 10 entries
- No RTHC / no notes on pre-hospital care: 3 cases (12%)

**Table 3.1.2. Modifiable factors: *Administrative problems* in under-5 deaths**

| | **No. of cases*** | ***%*** *(n =74 cases)* |
|---|---|---|
| Road-to-health card not used appropriately | 21 | *28* |
| Notes insufficient | 17 | *23* |
| Road-to-health card missing | 10 | *14* |
| Lack of equipment / equipment not functioning | 5 | *7* |
| Lack of policy | 4 | *5* |
| Basic laboratory investigations not available | 3 | *4* |
| Transport problems | 2 | *3* |
| Lack of accessibility / Lack of health care facility | 3 | *4* |
| Lack of personnel / lack of appropriately trained personnel | 1 | *1* |
| Communication problems: staff – staff / staff - caregiver | 4 | *5* |
| Lack of drugs / IV solutions / Oxygen / blood products | 2 | *3* |
| No administrative modifiable factor | 0 | *0* |

**A case can have more than one modifiable factor.*

**Table 3.1.3. Modifiable factors in under-5 deaths *Clinical personnel related***
(Total number of assessable cases = 50)

| ***Primary health care level*** | No. of entries* |
|---|---|
| Insufficient case assessment | 5 |
| Insufficient case monitoring | 3 |
| Insufficient case management | 8 |
| Delay in referring acute problem | 14 |
| Delay in referring chronic problem | 1 |
| Other modifiable factor at PHC level | 1 |
| No modifiable factor at PHC level identified | 35 |
| ***Hospital Admission and emergency care*** | No. of entries* |
| Insufficient case assessment | 98 |
| Insufficient case monitoring | 21 |
| Insufficient case management | 16 |
| No modifiable factor identified | 8 |
| ***Hospital routine care and referral*** | No. of entries* |
| Insufficient case assessment | 52 |
| Insufficient case monitoring | 18 |
| Insufficient case management | 5 |
| Delay in calling for senior opinion / referring | 0 |
| Inadequate IV fluids (prescription, recording or administered) | 5 |
| Inadequate feeding (prescription, recording or administered) | 0 |
| Other modifiable factor in hospital routine care / referral | 0 |
| No modifiable factor in routine care / referral identified | 14 |

** A case can have more than one modifiable factor*

## Modifiable factors - Caregiver and family related

- No information available: 28 cases (56%)
- Delay in seeking care: 6 cases (12%)
- Caregiver not realizing the severity: 7 cases (14%)

- Declining HIV test: 4 cases (8%)

## Discussion and problems identified

The nursing personnel attended the audit meetings with interest. The fact that there is no permanent medical officer from the paediatric ward attending the meetings and taking responsibility for the audit, could hinder the improvement of hospital care, making use of the identified modifiable factors.

The overall case fatality rate (5.9%) is similar to other rural hospitals. Table 3.1.1 shows a limited number of causes of under-5 deaths. This may be due to the fact that medical officers involved in the case-management were seldom available during the audit meetings. Data had to be taken from the files, and this was not always specific. Test results for *HIV-tests* were often not recorded in the file, and AIDS as a cause of death could only be suspected. A high number of acute gastro-enteritis deaths and no sepsis cases probably show the need for more specific diagnosis and case-management.

It was unfortunate that very little *information* could be retrieved regarding the health of the mother. The lack of information features as a general problem and also made the detection of other modifiable factors incomplete (e.g. “inappropriate use of the RTHC” or “incomplete physical examination” could often not be identified).

The prevalence of *underweight and severe malnutrition* in under-5 deaths is alarming but consistent with findings in other hospitals during the field-testing. The fact that only one hypoglycaemic case was recorded is probably due to a lack of appropriate management and testing for low blood sugar rather than it not occurring.

Regarding *administrative modifiable factors*, the lack of the use of the RTHC was the biggest problem, with again insufficient notes to comment as another modifiable factor.

When looking at *clinical personnel modifiable factors* at *primary health care level*, delay in referring an acute problem was common. Insufficient case assessment and monitoring is relatively low. However, the number of children referred from primary facilities was less than those coming to the hospital on their own. Therefore it is difficult to comment on the quality of care at PHC level.

"*Insufficient case assessment*" is the biggest problem when looking at hospital admission and emergency care and during hospital routine care and referral. Notes were incomplete about the presence or severity of respiratory distress, the level of dehydration, neck-stiffness in cases of fever and the clinical signs of suspected HIV. It was therefore difficult to evaluate the case-management.

Other important modifiable factors are "insufficient case monitoring" and "case-management" in hospital. The number of cases identified at Metsimaholo seems to be high compared to other hospitals during the field-testing. Management of fluids and availability of laboratory results are modifiable factors that could change the outcome considerably.

A positive result of the study was that the recording of weights in the hospital wards improved during the field-testing. The nursing staff attending the audit meetings did this. In-service training for doctors also evolved from the U5PIP meetings. Training entailed IMCI as a basis, with further discussions on case-management at hospital level, e.g. management of severe pneumonia and PCP.

## Recommendations and plans

- The management was informed about the outcome of the U5PIP audit. All medical officers will be made aware of the results.
- An admission form for children was suggested to be used as a tool to capture all necessary information during initial case-assessment.
- It became evident that continuous in-service training on common causes of under-5 deaths will be required.
- The presence of medical officers at the audit meeting is recommended.
- This team supports extending the investigations to include deaths of children up to 13 years.

## Chapter 3.2

## U5PIP in Kalafong Hospital, Gauteng Province

### Introduction

Kalafong Hospital is situated at Atteridgeville, a township West of Pretoria, with a mixture of formal and informal settlements. Most of the patients are of low socioeconomic status and a few are of middle class range. The hospital also serves as referral centre for most of Mpumalanga. Kalafong hospital is a regional hospital but it provides also primary and some tertiary services. Kalafong is part of university of Pretoria and has responsibility of teaching both undergraduate and postgraduate medical students.

The paediatric department is made up of the following wards: high care neonatal unit, ICU, KMC, general paediatric medical ward, which admits a total of up to 40 patients, and an oncology ward with the same capacity. We also have an outpatient department that provides emergency care, general outpatient and specialist care. We have 14 fulltime registrars/medical officers and 8 paediatricians.

### Basic data

**Case fatality rates in under-5 patients**

The total number of under-5 admissions between 1/9/2003 and 31/08/2004 was 3927 and of these 134 children died.

| | | |
|---|---|---|
| The overall case fatality rate (CFR) was: | | 3.4% |
| | For LRTI-admissions | 5.0% |
| | For GE | 1.9% |
| | For Severe malnutrition | 24. 7% |

**Audit meetings**

Every Friday we hold a morbidity and mortality meeting where we discuss patients who died and those that are difficult to manage in the ward. All the doctors at the department attend, and now the nurses in charge of the wards have joined us.

### Key findings

**Age groups**

134 children in the age group 1month to 5 years died during this 1year period. Of these 62.7% were less than 12 months, 13.4% were between 12 months and 24 months and 23.1% were above 2 years of age.

**Table 3.2.1. Probable main causes of under-5 death**

| | No. of cases | % of total |
|---|---|---|
| Lower respiratory tract infection (LRTI) | 56 | 41.8 |
| Sepsis/possible serious bacterial infection | 22 | 16.4 |
| Gastro enteritis / hypovolaemic shock | 16 | 11.9 |
| Aids | 7 | 9.5 |
| Meningitis | 6 | 4.5 |
| Tumours | 4 | 3.0 |
| All TB | 3 | 2.2 |
| Congenital heart lesion/cardiomyopathy. | 3 | 2.2 |
| Croup | 3 | 2.2 |
| Bowel obstruction | 2 | 1.5 |
| Respiratory failure | 2 | 1.5 |
| Ill defined | 2 | 2.2 |
| Pleural effusion | 1 | 0.8 |
| Heart failure | 1 | 0.8 |
| Kwashiorkor | 1 | 0.8 |
| Anaesthetics related death | 1 | 0.8 |
| Viral Meningo-encephaitis | 1 | 0.8 |
| Other diagnosis | 1 | 0.8 |
| Drowning | 1 | 0.8 |
| **Total** | **133** | **100** |

## Other causes of death

Most of the children had more than one disease process. Associated causes of death were AIDS in 32.8%, severe malnutrition in 28.4%, gastroenteritis including chronic diarrhoea in 21.6% and sepsis in 17.2% of the cases.

## AIDS and HIV positive

50 (37.3%) cases had a clinical diagnosis of AIDS with a positive HIV Elisa test, and 25 (22.3%) had symptomatic HIV disease with a positive HIV Elisa test. 7 (12.3%) cases had symptomatic HIV disease, but could not be tested. Thus a total of 82 cases (61.2%) were probably HIV related deaths. Most of cases diagnosed as symptomatic HIV-disease actually died of pneumonia with clinical features suggesting Pneumocystis carinii pneumonia.

## Mothers' health

In 54 cases (40%) the health of the mother was not known or documented in the files. In 80 cases with documentation 8 mothers were chronically ill, and there were 3 orphans.

## Prevalence of malnutrition

84 cases (62.7%) were underweight. 38 (28.4%) had severe malnutrition, 5(3.7) cases had hypoglycaemia.

**Duration of hospital stay and time of death**

73 (54. 5) children died during daytime (07:00-18:59) 58 (43.3) during night-time (19:00-06:59), although at night more patients died after midnight. In 3 cases time of death was not known.

32 (23.9) cases died within 24 hours of admission and mostly because patients came too late.

The remaining cases were distributed between:

| | |
|---|---|
| Duration of hospital stay of >7 days | 38(20. 9) |
| Duration of hospital stay of 4-7 days | 26(19.4) |
| Duration of hospital stay of 1-3 days | 35(26.1) |

**Modifiable factors - Lack of information**

In 12 cases notes were insufficient to comment, in 10 cases files were not found at the time of audit and in 4 cases no road to health card (RTHC) was available.

**Modifiable factors - Caregiver and Family related**

The following Caregiver and Family related modifiable factors were identified: Not realizing the severity of the illness (in 7.5%), declining an HIV-test (6%), delay in seeking care (6.7%) and infrequent clinic attendance (4.5%). In 18 (13.4%) there was no document in the file about caregiver or family related problem

**Table 3.2.2. Administrative modifiable factors in under-5 deaths**

| | No. of cases (Total=134) | % of cases |
|---|---|---|
| Road to health card missing | 4 | 16 |
| Transport problem | 0 | 0 |
| Lack of accessibility / lack of health care facility | 5 | 3.4 |
| Lack of personnel / lack of appropriately trained personnel | 0 | 0 |
| Communication problem: staff / staff-caregiver | 2 | 1.5 |
| Lack of drugs / IV solutions/oxygen/blood product | 6 | 4. 5 |
| Lack of equipment / equipment not functioning | 3 | 2.2 |
| Notes insufficient/lack of info | 8 | 6.0 |
| Lack of ICU beds | 13 | 9.7 |
| Others | 4 | 3 |
| No administrative modifiable factor | 83 | 61.9 |

**Table 3.2.3. Modifiable factors in under-5 deaths *Clinical personnel related* at Kalafong hospital** 1/9/2003-29/2/2004 (as identified by U5PIP)

| ***Primary health care level*** (We could not asses the PHC level properly because most of the patient were self-referred. The 4 cases with modifiable factors were referred from general practitioners and referring level 1 hospital.) | **No. of entries*** |
|---|---|
| Insufficient case assessment | 3 |
| Insufficient case monitoring | 0 |
| Insufficient case management | 4 |
| Delay in referring acute problem | 4 |
| Delay in referring chronic problem | 0 |
| Other modifiable factor at PHC level | 0 |
| ***Hospital Admission and emergency care*** (Total number of assessable cases = 125. In 114 cases no modifiable factor in hospital A and E care was identified)) | No. of entries* |
| Insufficient case assessment | 8 |
| Insufficient case monitoring | 0 |
| Insufficient case management | 3 |
| ***Hospital routine care and referral*** (Total number of assessable cases = 124. In 111 cases no modifiable factor in hospital routine care was identified)) | No. of entries* |
| Insufficient case assessment | 4 |
| Insufficient case monitoring | 5 |
| Insufficient case management | 4 |
| Delay in calling for senior opinion / referring | 2 |
| Inadequate IV fluids (prescription, recording or administered) | 8 |
| Inadequate feeding (prescription, recording or administered) | 2 |
| Other modifiable factor in hospital routine care / referral | 8 |

* *A case can have more than one modifiable factor in each section*

## Discussion

Major killers for children at Kalafong hospital were LRTI, sepsis and acute gastroenteritis. The majority of children who died were infants, and many were HIV related deaths, which reflects the prevalence of HIV in our country. Most of the infants died of LRTI, with suspected Pneumocystis carinii pneumonia (PCP). These patients died despite receiving IV Co-trimoxazole and steroids and the question arises, is it another pathogen causing the LRTI and we could not get ICU beds for these infants? Most of these infants were not on Co-trimoxazole prophylaxis, which is a poor reflection on our PMCTC programme.

The majority (62%) of our patients were under the third centile with half of them having severe malnutrition. We postulate that this is multifactorial involving poverty and HIV-disease. 70% of the children came from a poor background and 61% of the deaths were HIV related. If we can reduce the

level of poverty and improve nutrition we can reduce the rate of progression of HIV-disease.

The U5PIP programme is a useful tool to identify why children are dying in hospital and also how one can modify problems related to their death. In Kalafong it has helped us to quantify how many deaths are HIV-related and also which deaths may have been preventable or not.

We were hoping that this programme would highlight the problems of lack of equipment and personnel, especially on the nursing side, but it did not, as no death could not be directly attributed to staff issues. The audit showed to us, how much can be achieved with little.

## Problems identified

1. Getting the nurses on board for the audit-meetings. At present they come but not all the time.
2. Proper assessment of the use of the road to health card was a problem, because we did not have the card at the time of the audit. In Kalafong the RTHC does not stay in the patient's file. It is seen during admission and thereafter the mother takes it back home. Information documented on the file will be about immunization status and not how it was used at the clinic.
3. It is also a problem to get doctors to collect statistics as this is seen as extra paper work. In Kalafong this is compounded by the fact that the clinical assistants rotate every 4 months to other hospitals.

## Recommendations

1. The use of the U5PIP programme should not be limited to under -5 deaths only but should be developed for older children as well. Additionally, we should be able to classify those who died in the hospital *and* those who died at home, in cases were information could be obtained.
2. Intensifying the PMCTC programme and Co-trimoxazole prophylaxis for HIV-exposed infants.
3. To help with the teaching of the household component of IMCI so as to avoid cases were children came too late and caregivers did not realize the severity of the illness.

## Chapter 3.3

## U5PIP in Pietermaritzburg

### Introduction

Pietermaritzburg, situated in the KwaZulu-Natal midlands, is the Provincial capital and tertiary referral centre for the western half of KwaZulu-Natal.

It has 5 public sector hospitals, 2 psychiatric and 3 acute care hospitals – Northdale Hospital providing level 1 care, Edendale Hospital providing levels 1 and 2 care and Grey's Hospital providing levels 2 and 3 care.

The population served is urban, peri-urban and rural with an estimated 960819 people living in the Greater Pietermaritzburg area and 3,2 million in its tertiary catchment areas. The paediatric bed and staffing allocation in these three hospitals is reflected in the following table:

| Hospital | Total beds | NN / Paed beds | Consultant | MO | Intern |
|---|---|---|---|---|---|
| Northdale | 385 | 25 / 52 | 0 | 5 | 5 |
| Edendale | 1100 | 70 / 110 | 3 (+3 part time) | 10 | 6 |
| Grey's | 485 | 30 / 37 | 2 (+1 part time) | 8 | 2 |

Northdale and Edendale Hospitals participated in the U5PIP study mainly through a retrospective folder review as part of the national pilot project. Thereafter Grey's Hospital undertook a similar 12-month retrospective review.

### Basic data

During the study period 01/09/03 - 31/08/04 the total number of medical under-5 admissions in the 3 hospitals was 6190 with 694 medical under-5 deaths. The overall case fatality rate (CFR) was 11.2%.

**Table 3.3.1. Basic data and case fatality rates for Northdale, Edendale and Grey's Hospitals:**

| | NDH | EDH | GH | Tot PMB |
|---|---|---|---|---|
| **Total number of paeds medical admissions** | 3185 | 3454 | 979 | 7618 |
| **Total number medical U5-admissions** | 2702 | 2811 | 677 | 6190 |
| **Total no. of medical U5-deaths** | 200 | 415 | 79 | 694 |
| **CFR for all medical U5-admissions (%)** | **7** | **15** | **12** | **11** |
| No. of deaths underweight | 132 | 236 | 50 | 418 |
| No. of deaths weight not known | 8 | 74 | 6 | 88 |
| % of deaths underweight[1] | 69 | 69 | 68 | 69 |
| No. of deaths 1-12 months old | 138 | 265 | 46 | 449 |
| % of deaths 1-12 months old | 69 | 64 | 58 | 65 |
| No. of LRTI admissions | 899 | 960 | 176 | 2035 |
| No. of deaths with LRTI (main cause) | 62 | 139 | 10 | 211 |
| **CFR for LRTI (%)** | **7** | **14** | **6** | **10** |
| No. of GE admissions | 993 | 690 | 74 | 1757 |
| No. deaths with GE (main cause) | 55 | 72 | 3 | 130 |
| **CFR for GE (%)** | **6** | **10** | **4** | **7** |
| No. severe malnutrition admissions | 60 | 217 | 34 | 311 |
| No. deaths with severe malnutrition | 55 | 114 | 18 | 187 |
| **CFR for severe malnutrition (%)** | **92** | **53** | **53** | **60** |

NDH – Northdale Hospital, EDH – Edendale Hospital, GH – Grey's Hospital

[1] Denominator = No. of deaths weight known

Note: No figures for number of underweight admissions, or CFRs for underweight or normal weight admissions

## Audit meetings

During the study period 5 audit meetings were held at Edendale and none at Northdale or Grey's Hospitals. The meetings lasted approximately 1 hour with an average of 3 deaths being reviewed on each occasion. Up to 5 staff members, mostly doctors, attended the meetings.

## Age distribution

68% of the deaths occurred in the first year of life, 12% in the 2nd year, and 19% after 2 years of age.

## Main causes of under-5 deaths:

**Table 3.3.2. Probable main causes of under-5 deaths in Northdale, Edendale and Grey's Hospitals (combined).**

| | No. of cases | *% of total* |
|---|---|---|
| Lower respiratory tract infection (LRTI) | 211 | *30.4* |
| Acute gastroenteritis (GE) | 130 | *18.7* |
| Sepsis / possible serious bacterial infection | 65 | *9.4* |
| Chronic diarrhoea | 58 | *8.4* |
| Bacterial meningitis | 26 | *3.7* |
| AIDS | 60 | *8.6* |
| Severe malnutrition (Marasmus, kwashiorkor) | 19 | *2.7* |
| Respiratory failure | 36 | *5.2* |
| TB (pulmonary / extra pulmonary) | 19 | *2.7* |
| Pneumothorax, Pyothorax, Pleural effusion | 3 | *0.4* |
| Viral meningoencephalitis | 2 | *0.3* |
| CCF / Pulmonary oedema | 7 | *1.0* |
| Cirrhosis, portal hypertension, liver failure | 9 | *1.3* |
| Hypoglycaemia | 1 | *0.1* |
| Congenital heart disease, cardiomyopathy | 5 | *0.7* |
| Other disease of CNS (codes 142; 402) | 8 | *1.2* |
| Other | 8 | *1.2* |
| Ill-defined and unknown causes of mortality | 23 | *3.3* |
| No diagnosis | 4 | *0.6* |
| [No information, file lost – still had diagnosis | 31] | |
| Total | 694 | *100* |

## Other causes of under-5 deaths

In the U5PIP up to three "other causes of death" can be entered for each case in addition to the "main cause of death". At Northdale, Edendale and Grey's hospitals the commonest were LRTI (28%), severe malnutrition (23%), gastroenteritis (13%), sepsis (10%), AIDS (7%) and all TB (7%).

## AIDS and HIV related deaths

Sixty five percent of the under-5 deaths were HIV and AIDS related. The subcategories were as follows:

15% clinical AIDS with a positive Elisa test
33% symptomatic HIV infection with a positive Elisa test
12% symptomatic HIV infection without a blood test.

## Mother's health

Five percent of the children who died were orphans, in 8% the mothers were chronically ill and in 43% no information was recorded about the mother's health.

**Prevalence of underweight and severe malnutrition**
Thirty one percent of children who died had severe malnutrition, 69% were underweight and in 1% hypoglycaemia was documented (calculated using the denominator of deaths where weight was known).

**Duration of hospital stay and time of death**
Fifty percent of the children died after hours between 18h00 and 07h00 and 33% died within 24 hrs of admission

**Modifiable factors - Lack of information**
In 13% of cases the RTH card was not available for the audit meeting and it was therefore not possible to analyze pre-hospital care. In 12% of deaths the notes were insufficient to comment on modifiable factors and in a further 7% the files were lost. All cases with files were audited.

**Modifiable factors - Caregiver and family related**
In 25% of cases there was a delay in seeking health care. In 15% the caregiver did not realise the severity of the illness and in 4% there had been infrequent clinic attendance. In 17% there was no information about the care given by the family.

**Table 3.3.3. Modifiable factors- *Administrative problems* in under-5 deaths**
(% is percentage of all cases 694 cases)

| | NDH | EDH | GH | *%* |
|---|---|---|---|---|
| RTHC missing | 1 | 77 | 5 | *12.0* |
| RTHCT not used appropriately | 0 | 31 | 3 | *4.9* |
| Lack of drugs / IV solutions / Oxygen / blood products | 0 | 29 | 11 | *5.8* |
| Communication problems: staff – staff / staff - caregiver | 0 | 29 | 3 | *4.6* |
| Lack of personnel / lack of appropriately trained personnel | 1 | 17 | 4 | *3.2* |
| Transport problems | 1 | 21 | 4 | *3.7* |
| Laboratory service inadequate | 0 | 12 | 3 | *2.2* |
| Lack of equipment / equipment not functioning | 0 | 10 | 2 | *1.7* |
| Lack of accessibility / Lack of health care facility | 2 | 6 | 1 | *1.3* |
| Other administrative modifiable factor | 0 | 2 | 1 | *0.4* |
| Notes insufficient | 0 | 70 | 13 | *12.0* |
| No administrative modifiable factor | 195 | 203 | 38 | *62.8* |

*A case can have more than one modifiable factor.
NDH – Northdale Hospital, EDH – Edendale Hospital, GH – Grey's Hospital

**Table 3.3.4. Modifiable factors- *Clinical personnel related problems* in under-5 deaths** (Number of entries)

| ***Primary health care level*** (Total number of assessable◊ cases = 200 at NDH; 371 at EDH and 73 at GH) | **NDH** | **EDH** | **GH** |
|---|---|---|---|
| Insufficient case assessment | 1 | 35 | 6 |
| Insufficient case monitoring | 0 | 26 | 0 |
| Insufficient case management | 0 | 33 | 5 |
| Delay in referring acute problem | 0 | 9 | 3 |
| Delay in referring chronic problem | 0 | 14 | 2 |
| Other modifiable factor at PHC level | 0 | 5 | 2 |
| No modifiable factor at PHC level | 199 | 231 | 60 |
| ***Hospital Admission and emergency care*** (Total number of assessable◊ cases = 200 at NDH; 385 at EDH and 77at GH) | **NDH** | **EDH** | **GH** |
| Insufficient case assessment | 1 | 289 | 27 |
| Insufficient case monitoring | 0 | 106 | 1 |
| Insufficient case management | 1 | 50 | 7 |
| Other modifiable factor in A and E care | 0 | 0 | 0 |
| No modifiable factor in hospital Admission and Emergency care | 198 | 178 | 61 |
| ***Hospital routine care and referral*** (Total number of assessable◊ cases = 200 at NDH; 376 at EDH and 77 at GH) | **NDH** | **EDH** | **GH** |
| Insufficient case assessment | 0 | 270 | 10 |
| Insufficient case monitoring | 1 | 99 | 6 |
| Insufficient case management | 1 | 70 | 6 |
| Delay in calling for senior opinion / referring | 0 | 29 | 12 |
| Inadequate IV fluids (prescription, recording or administered) | 2 | 118 | 4 |
| Inadequate feeding (prescription, recording or administered) | 0 | 35 | 1 |
| Other modifiable factor in hospital routine care/referral | 0 | 21 | 10 |
| No modifiable factor in hospital routine care and referral | 196 | 166 | 43 |

NDH – Northdale Hospital, EDH – Edendale Hospital, GH – Grey's Hospital

** A case can have more than one modifiable factor in each section*
*◊ Assessable cases = total – lost files – cases that lacked information to comment on modifiable factors*

## Discussion

It is immediately obvious from the data that Edendale Hospital's case fatality rate was disproportionately and alarmingly high.

For all the deaths at Edendale Hospital there were a total of 1918 modifiable factors. Of these, nearly 63% occurred within the hospital during both emergency and routine care. This is partly due to the fact that most of the information gathered in a folder review is about inpatient care and thus the associated modifiable factors are most easily identifiable. Nonetheless, it remains evident that major problems are occurring inside

our institutions. The modifiable factors were in the areas of assessment, monitoring and case-management, the three cornerstones of the process of caring for sick children, and reflect both medical and nursing deficiencies.

Exposure of junior staff to such substandard care may lead to a lowering of standards being accepted as the "norm", which can become self-perpetuating. It is felt that this is already happening at Edendale Hospital and may explain why the case fatality rate is twice that of any other site. Apathy prevails and both a non-facilitatory environment and non-facilitatory systems within Edendale Hospital add to this. The HIV/ AIDS epidemic also appears to have had a deep effect on staff that seems overwhelmed by a sense of futility.

Record keeping systems, at Edendale Hospital in particular, are chaotic and hamper every aspect of gathering and auditing information.

At the other end of the scale, the striking absence of modifiable factors at Northdale Hospital compared to both Edendale Hospital and the other pilot sites is hard to explain, but may reflect differences in approach to the auditing process.

At Grey's Hospital the case fatality rate was high at 12%, which may reflect its role as a referral centre. Almost all the modifiable factors were in the area of assessment, particularly at the emergency level, and this was felt to reflect inadequate senior medical cover. Monitoring was excellent and there were few problems with inpatient care.

Concerns were raised about the proportion of deaths at a tertiary centre due to AIDS and whether these children would not be more appropriately cared for outside the hospital setting.

### Problems identified

- Major problems with the fundamental processes of caring for sick children: Assessment, Monitoring and Management.

- Chaotic record keeping systems.

- Difficulty coordinating regular audit meetings in a busy ward with large numbers of deaths.

- The need for a uniform approach to the auditing process to facilitate comparisons between institutions.

## Recommendations

1. There is a need to review, define and implement acceptable basic standards of care. The achievement of this is dependent on core teams of non-rotating senior nurses and principal medical officers as well as sufficient consultants in each ward

2. In order for the U5PIP process to be a tool for improving health care, it is essential that all members of the health care team are involved in the programme and participate in audit meetings. These need to happen regularly at all sites.

3. Significant improvement in record keeping and archiving is required. Not only is the record keeping problematic with regard to statistics but it has also had a negative impact on patient care.

4. The information gathered through the U5PIP process has been presented to the hospital managements in the hope that they will assist in addressing the problems identified.

## Chapter 3.4

## U5PIP in Witbank Hospital, Mpumalanga Province

### Introduction

Witbank Hospital is situated in the Nkangala district in Mpumalanga Province. It is the main referral hospital for all 25 provincial hospitals for paediatric specialist care and neonatal intensive and high care. The estimated population of Mpumalanga Province is about 3 million. Witbank Hospital is situated in the Emalahleni municipal district, which has about 10 PHC facilities.

During the field-testing of the audit system the paediatric department consisted of 2 full-time paediatricians, 2 registrars from the University of Pretoria, 3 Medical Officers, 2 Community Service Doctors and 4 Interns.

### Basic data

During the field-testing period 1/9/2003-31/8/2004 the total number of medical under-5 admissions at Witbank Hospital was 1948.
One hundred and twenty five patients aged between 1 month and 5 years died in the same period. The overall case fatality rate (CFR) was 6,4%.

**Table 3.4.1. Basic data and case fatality rates**

| | **Witbank Provincial Hospital** |
|---|---|
| **Total number medical U5-admissions** | **1948** |
| **Total no. of medical U5-deaths** | **125** |
| **CFR for all medical U5-admissions (%)** | **6,4%** |
| No. of deaths underweight | 65 |
| % of deaths underweight | 52% |
| No. of deaths 1-12 months old | 93 |
| % of deaths 1-12 months old | 74,4% |
| No. of LRTI admissions | 693 |
| No. of deaths with LRTI (main cause) | 57 |
| **CFR for LRTI (%)** | **8,2%** |
| No. of GE admissions | 411 |
| No. deaths with GE (main cause) | 7 |
| **CFR for GE (%)** | **1,7%** |
| No. severe malnutrition admissions | 94 |
| No. deaths with severe malnutrition (“main cause” or “other cause” | 36 |
| **CFR for severe malnutrition (%)** | **38,3%** |

### Audit meetings

Mortality meetings are conducted weekly. All doctors and a representative from the nursing staff of each ward are expected to participate. This has

been a practice in our department long before the U5PIP was introduced. The duration of the meeting varies between 30 min and 1 hour depending on the number and complexity of deaths discussed.

### Age distribution

Seventy-four percent of children died during their 1st year of life; 11% during the 2nd year; and 15% were older than 2 years.

### Main causes of under-5 deaths

**Table 3.4.2. Probable main causes of under-5 deaths**

| | No. of cases | *% of total* |
|---|---|---|
| Lower respiratory tract infection (LRTI) | 57 | *45.6* |
| Respiratory failure, not classified | 4 | *3.2* |
| AIDS | 12 | *9.6* |
| Sepsis / possible serious bacterial infection | 10 | *8.0* |
| Acute gastroenteritis (GE) | 6 | *4.8* |
| Severe malnutrition (Marasmus, kwashiorkor) | 5 | *4.0* |
| TB (pulmonary/ extra pulmonary) | 2 | *1.6* |
| TB meningitis | 1 | *0.8* |
| Bacterial meningitis | 6 | *4.8* |
| Other inflammatory disease of CNS | 1 | *0.8* |
| Chronic diarrhoea | 3 | *2.4* |
| CCF/ pulmonary oedema | 2 | *1.6* |
| Congenital heart disease/ cardio myopathy | 4 | *3.2* |
| Acute renal failure | 2 | *1.6* |
| Chronic renal disease | 1 | *0.8* |
| Inhalation of foreign body or gastric contents | 2 | *1.6* |
| Other | 7 | *5.6* |
| **Total** | **62** | ***100%*** |

### Other causes of under-5 deaths

The commonest "other causes of death" at Witbank Hospital included pneumonia/LRTI (26 deaths), septicaemia/possible serious bacterial infection (23 deaths), PEM (27 deaths) and AIDS (15 deaths).

### AIDS and HIV related deaths

Eighty one percent of the under-5 deaths were HIV/AIDS related. The subcategories were as follows:

21% clinical AIDS with a positive Elisa test
51% symptomatic HIV infection with a positive Elisa test
9% symptomatic HIV infection of clinical AIDS without a blood test.

**Mother's health**

Eight percent of the children who died were orphans; in 35,5% of children no information was available to determine whether the patient was orphaned or not.

Seven percent of children who died had a chronically ill mother; in 45% of all U5-deaths no sufficient information regarding the mother's health was available.

**Prevalence of underweight and severe malnutrition**

Fifty two percent of children who died were underweight; 28% had severe malnutrition. In 6 of children who died, hypoglycaemia was documented.

**Duration of hospital stay and time of death**

Thirty six percent of children died within 24 hours of hospital admission; 42% of all children died between 18h00 and 7h00.

**Table 3.4.3. Modifiable factors- *Administrative problems* in under-5 deaths**

| | **No. of cases** | ***%*** *(n =62 cases)* |
|---|---|---|
| RTHC not available | 3 | 2.4 |
| Lack of accessibility / Lack of health care facility | 2 | *1.6* |
| Lack of personnel / lack of appropriately trained personnel | 3 | *2.4* |
| Communication problems: staff – staff / staff - caregiver | 3 | *2.4* |
| Lack of drugs / IV solutions / Oxygen / blood products (clinic level) | 2 | *1.6* |
| Lack of drugs/IV solutions/Oxygen / blood products (hospital level) | 1 | *0.8* |
| Lack of policy/protocol | 4 | *2.4* |
| Lack of notes | 6 | *4.8* |

**Table 3.4.4. Modifiable factors- *Clinical personnel related***

| ***Primary health care level*** | **No. of entries*** |
|---|---|
| Insufficient case assessment | 8 |
| Insufficient case management | 10 |
| Delay in referring acute problem | 2 |
| Other modifiable factor at PHC level | 3 |
| Inappropriate care/late referral by GP | 5 |
| Lack of information | 2 |
| ***Hospital Admission and emergency care*** | **No. of entries*** |
| Insufficient case assessment | 4 |
| ***Hospital routine care and referral*** | **No. of entries*** |
| Insufficient case assessment | 3 |
| Insufficient case monitoring | 2 |
| Insufficient case management | 4 |
| Lack of information | 3 |

* A case can have more than one modifiable factor in each section

**Modifiable factors – Lack of information**

The two commonest modifiable factors are the lack of a RTHC (5%) and insufficient information to comment on modifiable factors (3%).

**Modifiable factors – Caregiver and family related**

Caregiver and family related modifiable factors included the declining of an HIV test (4% of all deaths); delay in seeking help (9%) and caregiver did not realise severity of illness (9%).

## Discussion

The overall case fatality rate for children aged 1 month up to five years admitted at Witbank Hospital is 6,4%. Being admitted with severe malnutrition implies a case fatality rate of 38%. More than half of all deaths (52%) were associated with underweight.

Death in childhood occurs most commonly in infancy. The most common main cause of death was identified as LRTI/pneumonia. The majority of all deaths (81%) are HIV related. One third of children's deaths take place within the first 24 hours of admission. Less than half of all children's deaths occur after hours (between 18h00 and 07h00). There was a significant lack of information regarding social problems and mother's health.

Modifiable factors on the part of the caregiver relate to delay in seeking help and in declining an HIV-test. Lack of high-care facilities and their access, a lack of protocols and policies, the unavailability of VCT-services, the RTHC and poor notes and communication problems were identified as the most important administrative modifiable factors. Insufficient case assessment, case monitoring and case management as well as delays in referring patients were the most important modifiable factors relating to clinical personnel.

## Recommendations and Plans

1. Focus on IMCI training.
2. Get PMTCT program working efficiently.
3. Anti-retroviral treatment program to be implemented.
4. Improve quality of data collection.

# Chapter 3.5

## U5PIP in Kimberley, Northern Cape

### Introduction

Kimberley is a 560 bed regional hospital providing secondary and some tertiary care services to the Northern Cape, western Free State and the south west of the North West Province. Gordonia Hospital, Upington acts as a secondary referral centre for the western half of the Northern Cape.

A population of 90 000 children under 5 years in the Northern Cape is served. A third of the population stays in the Francis Baard district in or around Kimberley.

The department at Kimberley manages approximately 4000 inpatients and 13 000 outpatients per year. Another 10 000 patients are seen by primary care nurses at Galeshewe Day Hospital in Kimberley. An outpatient clinic is run 5 days per week from 08h00 – 16h00. During office hours this clinic also manages acute patients and emergencies.

Facilities at Kimberley include an 8 bed neonatal high care unit where babies weighing more than 1000 gram can be ventilated, a 6 bed paediatric high care unit which also offers ventilation, a 46 bed general paediatric ward, a 30 bed neonatal nursery a 22 bed paediatric surgical unit and 6 private beds. Breastfeeding mothers are accommodated in a breastfeeding lodge and in a Kangaroo Mother Care unit.

The Paediatric Department is also a satellite campus for postgraduate training for registrars (3-6 months) from the University of Free State. Three interns (2 months) and three community medical officers (6 months) rotate through the department.

Full time staff: Two paediatricians, two medical officers.
Part time staff: Two paediatricians, three medical officers.

Morbidity and mortality meetings are held Mondays – Thursdays every morning before daily activities start. On average 12 doctors and 7 nurses attend these meetings from the wards.

## Basic Data

**Table 3.5.1.**

| | n | % |
|---|---|---|
| Total number of paediatric admissions | 3967 | |
| Total number of paediatric medical admissions | 2874 | 72 |
| Total number of paediatric surgical admissions | 1093 | 28 |
| Total number of medical U-5 admissions | 2400 | |
| Total number of Under-5 admissions for LRTI (for last 6 months only) | 422 | |
| Total number of Under-5 admissions for G.E. (for last 6 months only) | 259 | |
| Total severe malnutrition admissions (for last 6 months only) | 101 | |
| Total number of paediatric deaths | 191 | |
| Total number of medical under-5 deaths | 173 | 91 |
| Total number of surgical under 5 deaths | 2 | |
| Total number of Under-5 deaths normal weight | 62 | |
| Total number of Under-5 deaths <3rd centile | 105 | 60 |
| Total number of Under-5 deaths weight unknown | 8 | |
| Total number of Under-5 deaths with severe malnutrition | 46 | 26 |
| U5-deaths occur in young infants (1- 12 months) | 107 | 61 |
| HIV-related U5-deaths | 83 | 47 |
| U5-deaths occurring in the first 24 hrs of admission | 51 | 29 |

## Key Findings

### Case Fatality Rates

Case Fatality Rate for under-5 medical admissions was 7.3%. (173/2400)
Case fatality rates for pneumonia, diarrhoea and severe malnutrition could only be calculated for the last 6 months.

| | | | |
|---|---|---|---|
| Pneumonia | 10.9% | (46/422) | |
| Diarrhoea | 8.5% | (22/259) | |
| Severe malnutrition | 28.7% | (29/101) | (Admissions under reported.) |

### Age Distribution

63 % of the deaths were aged 1 – 11 months. 20 % were 12 -24 months and 17% were between 2 and 5 years.

**Table 3.5.2. Probable main causes of under-5 deaths in Kimberley hospital**

| | No. of cases | *% of total* |
|---|---|---|
| Lower respiratory tract infection (LRTI) | 53 | *30* |
| Sepsis / possible serious bacterial infection | 33 | *19* |
| Acute gastroenteritis (GE) | 22 | *13* |
| AIDS | 20 | *11* |
| Bacterial meningitis | 10 | *6* |
| Other | 7 | *4* |
| Other CNS infection | 5 | *3* |
| Severe malnutrition (marasmus, kwashiorkor) | 4 | *2* |
| Ill defined and unknown | 4 | *2* |
| TB (pulmonary/ extra pulmonary) | 4 | *2* |
| Congenital heart disease; myocarditis | 3 | *2* |
| Congenital infection | 1 | *.6* |
| Congestive cardiac failure | 1 | *.6* |
| Croup | 1 | *.6* |
| Status epilepticus | 1 | *.6* |
| Liver failure | 1 | *.6* |
| Acute renal failure | 1 | *.6* |
| Drowning | 1 | *.6* |
| Inhalation of foreign body | 1 | *.6* |
| Surgical | 2 | *1* |
| Total | 175 | *100* |

## AIDS and HIV related deaths

**Table 3.5.3.**

| | Total | *%* |
|---|---|---|
| Symptomatic HIV (Elisa positive) | 56 | *67* |
| Symptomatic HIV (no test) | 7 | *8* |
| AIDS | 20 | *25* |
| Total | 83 | *100* |

## Mother's Health

Twenty-four (14%) mothers were chronically ill and eight children (5%) died were orphans. In fifty-two cases (30%) the health of the mother was unknown.

## Duration of Hospital Stay

Twenty one percent (36/175) of the deaths took place in the first 8 hours after admission. Fifty-two deaths (30%) took place in the first 24 hours and 40 (23%) deaths took place in patients more than 7 days in hospital.

## Time of death

**Table 3.5.4.**

| Time | Deaths | % |
|---|---|---|
| 07h00 – 17h59 | 67 | 38 |
| 18h00 – 23h59 | 26 | 15 |
| 24h00 – 06h59 | 45 | 26 |
| No information | 37 | 21 |

## Modifiable factors

(Only the common modifiable factors are reported.)

## Lack of information

In 15 cases no RTHC or information about pre-hospital care was available. In 3 cases the notes were insufficient to comment. Eight cases were not audited and no files were lost.

**Table 3.5.5. Modifiable factors: *Administrative problems* in under-5 deaths**

| | No. of cases* | *% (n =167)* |
|---|---|---|
| Road-to-health card missing | 15 | *9* |
| Notes insufficient | 3 | *2* |
| No modifiable factors | 147 | *88* |

*A case can have more than one modifiable factor.

**Table 3.5.6. Modifiable factors: Clinical personnel related**

| *Primary health care level* (Total number of assessable cases = 167. In 153 cases no modifiable factor at PHC level was identified) | No. of entries* |
|---|---|
| Insufficient case assessment | 11 |
| Insufficient case management | 8 |
| Delay in referring acute problem | 4 |
| Delay in referring chronic problem | 3 |
| *Hospital Admission and emergency care* (Total number of assessable cases = 167. In 160 cases no modifiable factor in hospital A and E care was identified) | No. of entries* |
| Insufficient case assessment | 5 |
| Insufficient case management | 15 |
| *Hospital routine care and referral* (Total number of assessable cases = 167. In 122 cases no modifiable factor in hospital routine care was identified) | No. of entries* |
| Insufficient case assessment | 8 |
| Insufficient case monitoring | 24 |
| Insufficient case management | 36 |
| Delay in calling for senior opinion / referring | 6 |

** A case can have more than one modifiable factor in each section*

## Family/Caregiver

In 34 cases there was a delay in seeking care. In 22 cases the mother declined a HIV test. In most of these cases no HIV test was done on the mother during pregnancy resulting in no nevirapine and co-trimoxazole being given with subsequent *Pneumocystis carinii* pneumonia in the infants. It was however not clear if mothers declined or if counselling was not offered at antenatal clinics. In 10 cases the caregiver did not realize the severity of the illness and in 10 there were infrequent clinic attendance. No modifiable factors could be identified in 92/167 (55%) cases.

**Clinical personnel related modifiable factors**

Table 3.5.6 lists the common modifiable factors. No assessment for failure to thrive (10 cases) was the most common problem at the primary health care level. The assessment and management of shock (7 cases) was the most common problem in the hospital admission and emergency care area. Five patients also did not receive appropriate antibiotics.

Overall, glucose, oxygen and electrolytes in order of frequency were the elements insufficiently monitored. Prescribing the correct antibiotics (15 cases) or other treatment not prescribed (9 cases) was identified as the most common reasons for insufficient case management.

## Problems identified

- Pneumonia, malnutrition, diarrhoea and AIDS are the major killers in children under 5 years.
- The majority of the deaths are in children under 1 year of age.
- Septicaemia is a major problem in immuno-compromised (HIV or severe malnutrition) children.
- Pneumonia is the main cause of death in HIV positive children.

## Recommendation and Plans

1. Aggressive feeding schemes at primary care clinics aimed at 6 months – 2 years of age. Exclusive breastfeeding to be promoted for the first six months.
2. Train all primary care health workers in IMCI strategy.
3. Access to anti retroviral therapy for all pregnant mothers and children with low CD4 counts. More emphasis on co-trimoxazole prophylaxis from 6 weeks of age for HIV exposed babies.
4. Adult education programs for mothers.

## Chapter 3.6

## U5PIP in Mafikeng region, North West Province

### Introduction

Mafikeng region is situated in North West province. The following five public sector hospitals participate in the under-5 mortality audit: Zeerust, Lehurutshe, Mafikeng Provincial, Thusong and Gelukspan hospitals. The region has 99 PHC facilities. They serve a mainly rural and periurban population of 762 994.

Mafikeng Provincial Hospital had a fulltime paediatrician only during 2003. Thereafter and also in the other hospitals medical officers do the paediatric work and community services doctors. The author works in Mafikeng region as regional paediatrician. The "Mafikeng region" data is the amalgamated data of the 5 hospitals.

### Basic data

**Table 3.6.1. Basic data and case fatality rates for hospitals in Mafikeng region**

| | Maf | Leh | Zee | Thu | Gel | ***Reg*** |
|---|---|---|---|---|---|---|
| **Total no. medical U5-admissions** | 1740 | 593 | 483 | 678 | 895 | *4389* |
| No. of underweight admissions | | | | 343 | 494 | |
| % of admissions underweight | | | | 51 | 55 | |
| **Total no. of medical U5-deaths** | **146** | **34** | **25** | **84** | **67** | ***356*** |
| **CFR for medical U5-admissions (%)** | 8.4 | 5.7 | 5.2 | 12.4 | 7.5 | ***8.1*** |
| No. of deaths underweight | 94 | 26 | 21 | 64 | 53 | *258* |
| No. of deaths weight unknown | 16 | 3 | 1 | 4 | 1 | *25* |
| % of deaths underweight | 72 | 84 | 88 | 80 | 80 | *78%*[1)] |
| **CFR for underweight admissions (%)** | | | | 19 | 11 | ***14***[2)] |
| **CFR for normal weight admissions %** | | | | 5 | 3.2 | ***4***[2)] |
| No. of deaths 1-12 months old | 95 | 27 | 17 | 53 | 46 | *238* |
| % of deaths 1-12 months | 65 | 79 | 68 | 63 | 69 | *67* |
| No. of LRTI admissions | 508 | 163 | 120 | 253 | 270 | *1314* |
| No. of deaths with LRTI (main cause) | 43 | 10 | 8 | 21 | 15 | *97* |
| **CFR for LRTI (%)** | 9 | 7 | 8 | 9 | 6 | ***7.4*** |
| No. of GE admissions | 240 | 143 | 111 | 181 | 175 | *850* |
| No. deaths with GE (main cause) | 11 | 4 | 3 | 13 | 10 | *41* |
| **CFR for GE (%)** | 5 | 3 | 3 | 8 | 6 | ***4.8*** |
| No. severe malnutrition admissions | 116 | 47 | 50 | 70 | 115 | *398* |
| No. deaths with severe malnutrition ("main cause" or "other cause") | 33 | 14 | 10 | 19 | 23 | *99* |
| **CFR for severe malnutrition (%)** | 29 | 30 | 20 | 27 | 20 | ***25*** |

[1)]Denominator: Deaths with known weight [2)]Data only from 2 hospitals

Maf – Mafikeng Hospital, Leh – Lehurutshe Hospital, Zee – Zeerust Hospital, Thu – Thusong Hospital, Gel – Gelukspan Hospital, Reg. – Mafikeng Region

During the study period 1/9/03-31/8/04 the total number of medical under-5 admissions in the 5 hospitals was 4389. The medical under-5 deaths that occurred within the health system were 356. The overall case fatality rate (CFR) was 8.1%.

**Audit meetings**

During the study period 67 audit meetings were held. In Mafikeng provincial hospital (MPH) this was done every 2 weeks, in the other hospitals monthly. One to 14 cases were discussed per meeting; the duration of the meetings varied between 1 and 2.5 hours. Between 1 and 8 doctors and 1-11 nurses attended each meeting.

**Age distribution**

Sixty seven percent of children died during their 1st year of life; 25% during the 2nd year; and 8% were older than 2 years.

**Main causes of under-5 deaths:**

**Table 3.6.2. Probable main causes of under-5 deaths**

| | No. of cases | *% of total* |
|---|---|---|
| Lower respiratory tract infection (LRTI) | 97 | *27.2* |
| AIDS | 55 | *15.5* |
| Sepsis / possible serious bacterial infection | 52 | *14.6* |
| Acute gastroenteritis (GE) | 41 | *11.5* |
| TB (pulmonary/ extra pulmonary) | 15 | *4.2* |
| Severe malnutrition (Marasmus, kwashiorkor) | 14 | *3.9* |
| Bacterial meningitis | 14 | *3.9* |
| Hospital acquired infections | 10 | *2.8* |
| Hypoglycaemia | 6 | *1.7* |
| CCF/ pulmonary oedema | 5 | *1.4* |
| Liver disease | 4 | *1.1* |
| Chronic diarrhoea | 4 | *1.1* |
| Status epilepticus | 2 | *0.6* |
| Surgical | 2 | *0.6* |
| Paraffin poisoning | 1 | *0.3* |
| Acute renal failure | 1 | *0.3* |
| Congenital heart disease | 1 | *0.3* |
| Other | 4 | *1.1* |
| No diagnosis | 9 | *2.5* |
| No information, file lost | 19 | *5.3* |
| Total | 356 | *100* |

**Other associated causes of under-5 deaths**

In the U5PIP up to three “other causes of death” can be entered for each case, additional to the “main cause of death”. The commonest in Mafikeng

region were severe malnutrition (25%), sepsis (24%), LRTI (13%), acute or chronic gastroenteritis (13%) and TB (9%).

## AIDS and HIV related deaths

Fifty eight percent of the under-5 deaths were HIV and AIDS related. The subcategories were as follows:

16.3 % clinical AIDS with a positive Elisa test
21.1 % symptomatic HIV infection with a positive Elisa test
20.2 % symptomatic HIV infection or clinical AIDS without a blood test.

**Mother's health**

Six percent of the children who died were orphans; in 25% the mothers were chronically ill; in 20% we did not have information about the mother's health.

**Prevalence of underweight and severe malnutrition**

In 7% of under-5 deaths the child's weight was not known. In the deaths with known weights 78% occurred in underweight children; 30% had severe malnutrition. In 9% hypoglycaemia was documented.

**Duration of hospital stay and time of death**

Half of the children died between 18h00 and 7H00; 26% died during the first 24 hrs of hospital stay.

**Modifiable factors - Lack of information**

In 46% of cases the RTHC was not available for the audit meeting to analyze pre-hospital care; in 22% the notes were insufficient to comment on modifiable factors; 5% of the files were lost.

**Modifiable factors – Caregiver and family related**

In 17% of cases delay in seeking healthcare was noted; in 8% the family declined to have an HIV-test done. Four percent had infrequent clinic attendance. In 42% we did not have information about the care given by the family.

**Table 3.6.3. Modifiable factors- *Administrative problems* in under-5 deaths**

| | No. of cases* | % (n =356 cases) |
|---|---|---|
| RTHC not available | 162 | 46 |
| Transport problems | 10 | *3* |
| Lack of access / Lack of health care facility / Lack of beds | 32 | *9* |
| Lack of personnel / lack of appropriately trained personnel | 44 | *12.4* |
| Communication problems: staff – staff / staff - caregiver | 29 | *8.1* |
| Lack of milk / food | 17 | *6.2* |
| Lack of drugs / IV solutions / Oxygen / blood products | 13 | *4* |
| Lack of equipment / equipment not functioning | 10 | *3* |
| Lack of notes | 75 | *21* |
| Other administrative modifiable factor | 36 | *10.1* |
| No administrative modifiable factor | 103 | *29* |

*A case can have more than one modifiable factor.

**Table 3.6.4. Modifiable factors- *Clinical personnel related***

| ***Primary health care level*** (Total number of assessable cases = 175. In 84 cases no modifiable factor at PHC level was identified) | **No. of entries*** |
|---|---|
| Insufficient case assessment | 50 |
| Insufficient case monitoring | 22 |
| Insufficient case management | 37 |
| Inappropriate use of RTH card | 7 |
| Delay in referring acute problem | 18 |
| Delay in referring chronic problem | 47 |
| Other modifiable factor at PHC level | 7 |
| ***Hospital Admission and emergency care*** (Total number of assessable cases = 309. In 138 cases no modifiable factor in hospital A and E care was identified) | No. of entries* |
| Insufficient case assessment | 155 |
| Insufficient case monitoring | 90 |
| Insufficient case management | 175 |
| ***Hospital routine care and referral*** (Total number of assessable cases = 279. In 126 cases no modifiable factor in hospital routine care was identified) | No. of entries* |
| Insufficient case assessment | 44 |
| Insufficient case monitoring | 29 |
| Insufficient case management | 27 |
| Delay in calling for senior opinion / referring | 5 |
| Inadequate IV fluids (prescription, recording or administered) | 89 |
| Inadequate feeding (prescription, recording or administered) | 39 |
| Other modifiable factor in hospital routine care / referral | 14 |

** A case can have more than one modifiable factor in each section*

## Discussion

Table 3.6.1 shows *case fatality rates* (CFRs) for all cases, for lower respiratory tract infections and gastro enteritis. Case fatality rates for underweight children are –as expected - markedly higher than for normal weight children, although this could only be documented in 2 of the 5 hospitals.

CFRs for admissions with severe malnutrition are very high. However, this figure is not accurate, because in many admissions severe malnutrition was not recorded as diagnosis in the ward register. Another problem is that many of these children also had severe symptomatic HIV infection and thus a high risk of dying.

During 2001 the under-5 mortality audit in Mafikeng region showed an overall CFR of 5.7%.[1] It has now increased to 8.1%, which may be explained partially by the progressing HIV-epidemic.

Most *audit meetings* were well prepared by the nurse and doctor responsible for the respective paediatric ward. Nurses and doctors attending audit meetings participated actively and found the process educative. Both managers and health workers appreciate that it is important to review deaths and that the information gained is crucial to improve quality of healthcare.

*Causes of death* and *the age distribution* are similar to the findings in Mafikeng region during 2001.[1] But gastro-enteritis as main cause of death has increased from 3.8% in 2001 to 11.5% in the present study. The CFR for gastro-enteritis admissions has increased from 1.4% in 2001 to 4.8% in 2003/04. This is worrying, because it is a treatable condition and may show deterioration in PHC and homecare practices and in casualty case-management.

The impact of *HIV/ AIDS* on under-5 deaths has not changed much (61.9% in 2001 vs. 58% of the deaths in the present study). We must bear in mind that these are deaths *within* the health system, and more children may die at home.

**High Prevalence of underweight and severe malnutrition**

Underweight in the children who died has increased from 69% in 2001 to 78%; severe malnutrition has increased from 22% to 30%. With the present U5PIP-software it is not possible to determine how many of the underweight or severely malnourished children were also HIV positive, but

the percentage is expected to be high. This information should be available, once we can produce an updated version of the U5PIP programme.

**Modifiable factors – Caregiver and family related**
Fifty-eight percent of cases had information on care-seeking behaviour (vs. 61% in 2001[1]). Delay in seeking care remained constant (16% vs. 17%). Infrequent clinic attendance has decreased from 11% to 4%. Declining an HIV-test has decreased from 19% to 8%.[2] On the whole the cooperation with caregivers and families seems to be satisfactory.

**Modifiable factors – Administrative problems**
Transport problems have decreased from 9.6% to 3%; but as 47% of cases lacked records on pre-hospital care, this may be underreported.

Lack of (appropriately trained) personnel has increased from 8.4% to 12.4%. The main problems were lack of senior (post-community service) doctors and lack of professional nurses, especially during the night or during weekends.

The reported of lack of equipment has decreased from 13% to 3% of cases. Milk/ food supply was insufficient in paediatric wards in 6% of cases. This has been addressed with relevant hospital managers.

**Modifiable factors – Clinical personnel related – PHC level**
On the whole this has not changed much compared to the 2001-findings, although IMCI training has now taken place in the region for 2 years. One problem about PHC-evaluation is that the data obtained is very incomplete (only 175 out of 356 cases had data about PHC).

**Modifiable factors – Clinical personnel related – Hospital care**
The most common *Monitoring problems* related to oxygen, IV-fluid and glucose monitoring. The most common deficiencies in *Case-assessment* occurred in shock and respiratory distress assessment and physical examination of the patient. The most common *insufficient case-management* related to antibiotic and IV-fluid prescriptions, oxygen therapy, management of shock and convulsions. Problems were identified in these areas in a similar frequency as during 2001.

Could this lead to the conclusion that the activities of the clinical audits during 2001 did not improve quality of care? Why do we see so little positive impact of it? There are several possible explanations. The region did not have any paediatrician during 2002 and no audits were done. Secondly, since 2002 fifteen senior doctors trained in paediatric care left the region, which means that even if doctors are being trained, their stay in

this rural region is usually short. Thirdly, many first level hospitals were restructured during 2003/2004; this process is still ongoing and cannot be influenced by health workers. Thus the paediatric care rendered would probably be worse without the audit activities.

## Problems identified and Recommendations

- We had little information about pre-hospital care due to lacking RTH-cards, and the participation from PHC-staff was low. The audit will only have an impact on PHC if we can change this.
- Underweight children must be identified at PHC level earlier and fully assessed for infections and enrolled in effective feeding programmes. Even if the majority of these children were HIV-positive, their survival can be extended significantly by better feeding and by treating other infections, especially TB.
- The PMTCT-programmes (including safe infant feeding) must be intensified and evaluated, to reduce paediatric HIV-infection.
- Hospitals that need audits and quality improvement *most* are often those where the *lack* of senior doctors and professional nurses is *most severe*. We urgently need effective and sustained strategies to attract and retain senior clinical personnel in rural areas. Without them patient care will continue to deteriorate, and clinical audits, which give evidence and help in problem solving, cannot even be conducted.
- The paediatric wards need stable teams of professional nurses for day and night duty, as in maternity units. Rotations should be kept to a minimum, to ensure best locally achievable paediatric inpatient care.
- Feeding and the management of IV-fluids in paediatric wards need special and continuous attention and supervision. Hospital budgets have become tighter, and the services of hospital kitchens have been outsourced, but this must never lead to a lack of food or milk in paediatric wards at any time, day or night.

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# Chapter 4

## Field-testing the U5PIP in 8 sites: Systems and processes

### Introduction

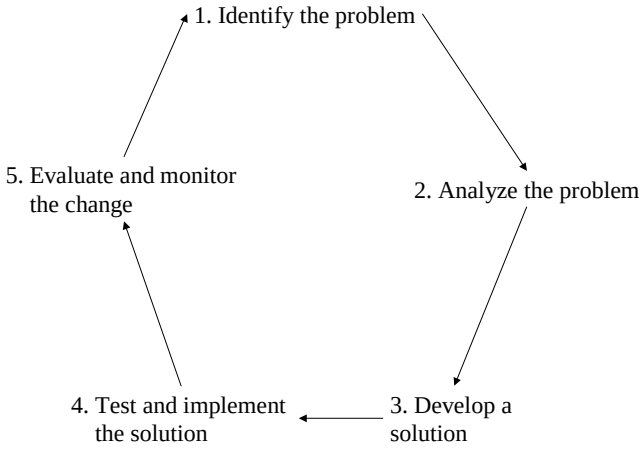
Mortality-audits can be used to identify where and why health systems fail. However, in paediatric care they are mainly used in academic hospitals, where post-mortems and histology services are available. The findings of these mortality-audits may not be representative for the majority of paediatric deaths. Peripheral and regional hospitals in developing countries, where most under-5 deaths take place, lack the tools to conduct audits systematically.

Many countries use clinical audits to improve quality of care in different fields of medicine.[26,27] Thomson O'Brien defines clinical audit and feedback as "any summary of clinical performance of healthcare over a specified period of time. The summary may include recommendations for clinical action. The information may be given (to health professionals) in a written, electronic or verbal form ".[26] Pattinson defines audit as "seeing whether the right thing is being done. Audit is a potent method of identifying problems in the healthcare service and enabling changes in the health service to occur ".[10]

A clinical audit can analyse *structures* in the healthcare system, e.g. staffing or the availability of drugs and equipment. It can also measure *process* indicators of health worker performance or indicators of patient *outcomes* or any combination of these.[26] In a mortality-audit deaths are identified and classified; patient records are reviewed and both structural aspects and processes in the healthcare system can be analysed.

Thomson O'Brien stresses the importance of linking audit to *feedback*, preferably feedback where health workers involved participate actively. Audit and feedback will not be effective if barriers to changing practice are not analysed and addressed.[26]

**The Audit cycle**




The audit cycle consists of the following main steps:

1. Identify the problem; find priorities
2. Analyse the problem and root causes
3. Develop a solution
4. Test and implement the solution. Adapt as necessary. - Health workers performing the task must be involved in finding a solution to the problem. The action taken may be *remedial* (addresses the symptom*), corrective (*corrects the problem and the system) or *preventive*.
5. Evaluate and monitor the change. Re-audit. Has the problem been resolved?[27,28,29]

To aim at *completing the audit cycle* is crucial. Here audit differs from other types of evaluation or ratings of health services.[30] Ong describes that many audit studies fail to complete the audit cycle.[31] Thus health workers cannot identify obstacles when implementing changes, and the implementation may lack sustainability.

**Audit meetings**

The concepts of audit meetings are similar to other quality improvement activities:

1. Preconditions are trust, mutual respect and confidentiality: in the case discussions patients' and health professionals' names are not mentioned in order to ensure confidentiality.[32]

2. The multi-professional team consists of doctors, nurses, relevant health managers and other health workers caring for the child. The approach is participatory; it is crucial to facilitate communication between the different professionals. The leading questions are: Are there modifiable factors that could have altered the outcome i.e. death, related to family behaviour, health administrative services or medical personnel (doctors and nurses)? The team should identify barriers to change and look for solutions to overcome them.
3. The facilitator has to be an experienced physician and his/her role is to be a coach/trainer, and to be non-judgemental and non-threatening. If the facilitator becomes judgemental, especially when criticising junior health workers, they will just stay away, and no learning will take place. When discussing deaths, health workers tend to become emotional; this needs a balanced, experienced approach to make use of "teachable moments".

Leading questions are:

- How can we improve our work?
- How can we measure the improvement?
- How can we give feedback to all role-players involved?
- Contributions should be based on *experience and evidence*. The facilitator promotes good *communication and adult learning principles.*[33]
- Problem solving requires *creative thinking*. In an atmosphere of mutual trust and participation, root causes of problems can be identified. The key to success is not to stop too soon when asking "why?" and to avoid the trap of blaming an individual early in the process.
- *Group intuition* helps to find *consensus*: in analysing the problems, in prioritisation of solutions and in implementation.
- A problem may arise: audits should be optional/voluntary, to enable trust in the group. But discussion points are often so important that attendance should be compulsory. Maybe we cannot solve this dilemma.

The Under-5 healthcare Problem Identification Programme (U5PIP) is an outcomes audit based on mortality and can be used as a diagnostic tool for assessing under-5 healthcare. It is based on two assumptions:

1. The study of a "few but important" cases (deaths) will detect problems in their care, and this reflects problems generally occurring in this healthcare system.
2. Problems that lead to a paediatric death are the same as those of other sick children, but they are more severe.[10]

This chapter summarizes the U5PIP audit system and processes during the field-testing of the U5PIP in eight different sites in South Africa between 1/9/2003 and 31/8/2004. It also gives recommendations for future use and development of this paediatric mortality audit.

## Methods

This study of under-5 deaths used and tested the Under-5 healthcare Problem Identification Programme (U5PIP). This audit system is based on the same principles being used in the Confidential Enquiry into Maternal Deaths and in the Perinatal Care Surveys of South Africa.[34,35]
The field-testing of the audit system took the form of *action research*. Action research is often linked with the implementation of new processes or interventions at institutional level. It involves quantitative and qualitative data collection and is adapted as the process evolves. This was the case with the three workshops and the email-communication with U5PIP-users during the field-testing. Feedback from the users initially modified the processes and directed further development of the audit system.

The sites were chosen to represent different levels of paediatric inpatient-care in five provinces in South Africa. An initial workshop was conducted to train U5PIP-users to implement the programme at their hospitals. During and after the field-testing two feedback-workshops were held.

The objectives of the field-testing were:

- To assess whether this audit system is feasible and acceptable for different paediatric teams
- To collect data on common causes of death and contributing conditions in under-5 children
- To determine health system failure, missed opportunities of intervention and substandard care relating to sick children
- To test if the U5PIP modifiable factor classification is useful to identify problems in paediatric healthcare
- To obtain information on necessary changes and improvements of the U5PIP

The field-testing included a prospective descriptive study of under-5 deaths occurring in the study hospitals during the study period. The findings of this study are described in the chapter “Why Children Die: Causes of under-5 child deaths and modifiable factors in paediatric healthcare in South Africa” of this report.

*Cause of death classification*

Internationally the ICD 10 is the gold standard for disease classification, but it is too comprehensive to be used in routine audit meetings in busy district or regional hospitals in less-developed countries. A classification of 48 categories of causes of death was developed, based on ICD 10, the South African Standard treatment guidelines and the WHO-IMCI-programme.[6,12,13] In paediatric patients often more than one cause contribute to a death.[4], and a paediatric audit system must provide for this possibility.

In the present system one main cause of death, up to three other causes of death and one contributing condition can be entered. The "main cause" is the probable cause that finally leads to the death of the child. "Other causes" are associated causes of death or severe diseases, which were also present during the days before the child died. "Contributing conditions" are other health related problems in the child, which may or may not have had a causative link to the death.[8] The classification of children with HIV/ AIDS is described in the first chapter of this report.

This classification process relies on patient records, clinical judgement and consensus opinion of doctors and nurses at audit meetings. It can be seen as the best achievable classification process under local circumstances. It can be used in district or regional hospitals, where access to post mortems and microbiological investigations is limited.

The 48 different categories were chosen, because each of them requires different actions in diagnostic and therapeutic case-management. The classification is thus a compromise between the full ICD-10 and classifications of only 6 or 8 causes of death, frequently used in low-income-countries, which do not distinguish between different treatment options available in district or regional hospitals in South Africa.[8]

The U5PIP-classification of causes of death is attached in the appendix.

*Modifiable factors*

Mortality audits are more effective if they are done in a systematic manner and if tools (like the Perinatal Problem Identification Programme) are used.[36] The tools guide health workers to identify and classify all deaths that have occurred. The next step is to identify substandard care and missed opportunities for intervention, which are called "Modifiable factors" in this study. Modifiable factors were defined as events, actions or omissions contributing to the death or contributing to substandard care in a child who died, and which, by means of locally achievable interventions, can be modified.

The list of Modifiable factors contains the categories Family / caregiver related problems; Administrative problems and Clinical personnel related problems.[16]

An example for a *caregiver problem* is giving an enema at home, which results in injury to the anus of the infant.

*Administrative modifiable factors* include organization of healthcare and logistic aspects. The most basic administrative problem is the lack of documentation of patient care. An audit can only evaluate care, which has been *recorded* in the patient's file. Thus the lack of documentation was considered as an administrative modifiable factor. Feedback from the audit and corrective interventions should lead to more complete record keeping, and only then the evaluation of healthcare rendered will become accurate. - The lack of a pulse oxymeter for a child with severe pneumonia in a district hospital is an administrative problem.

A *clinical personnel problem* is a child in hospital with severe dehydration and shock, who only receives oral rehydration, although resources for intravenous or intraosseus treatment are available.

Clinical personnel related problems are further divided into levels of care:

- Primary healthcare (PHC): e.g. a child was taken to the clinic for 5 consecutive months with a problem of cough. The child did not gain weight. The flat weight graph was plotted, but the clinic staff took no action.
- All doctors and nurses working in the hospital usually render admission and emergency care in hospital.
- Staff in paediatric wards provides routine care. This staff should be more stable and receive more specific training in paediatric care.

Clinical personnel related modifiable factors are further divided into 3 categories: a) *Assessment* of the child, b) *Monitoring* and c) *Case-management*, which includes treatment, feeding and follow-up. An example for an assessment-problem is a child who is admitted to hospital for chronic cough, but the admitting health worker did not enquire about TB contact. A monitoring-problem is a child with severe pneumonia in hospital, who is on oxygen, but the oxygen saturation is not monitored although a pulse oxymeter is available. An example for a case-management-problem is a malnourished child with very severe pneumonia, who only received oral Amoxicillin as antibiotic.

This classification method for modifiable factors was used to give direction during the audit meeting and to focus on problem areas, where change is

needed. To be specific about the modifiable factors facilitates decisions on specific interventions.[8]

The U5PIP list of Modifiable factors is attached in the appendix.

*Auditing the cases*
It is ideal to audit all deaths that occurred within the health system in audit meetings regularly. But this was not possible at all sites. The reports from the different sites reflect how cases were audited. All audited cases were included in the analysis.

Where audit-meetings took place, doctors and nurses involved in paediatric care attended and participated. This was part of their normal duties, but there was no coercion to attend. During the audit meetings records of all under-5 deaths were reviewed, and consensus on causes of death and modifiable factors was reached. This process of reviewing and discussing the patients' records and care involved varying degrees of interpretation and clinical judgment. Inference about the impact of modifiable factors resulted from group discussion and consensus and – although guided by guidelines and standards – to a certain degree remains subjective.[37]

**Monthly data**
During the study period monthly data on all under-5 admissions was collected from the paediatric ward registers. Case fatality rates were calculated for all under-5 admissions and separately for LRTI, gastroenteritis and severe malnutrition. The quality of ward registers varied in the different institutions, and it was not possible to collect all data from all sites. One positive effect of the field-testing was that health workers understood the importance of accurate admission registers and that the quality of data collection has now improved.

*Feedback*
Feedback was given to health workers during the audit meetings and to relevant health managers after the study period.

## Results

*Processes and workshops*
During the beginning of 2003 the U5PIP system and software were developed and a user manual was written. New elements were immediately tested in Mafikeng region.

The first U5PIP workshop was held in Kempton Park on 31/7/03. Doctors from the sites of the field-testing were introduced to this paediatric

mortality audit system, to the concepts and the software. During the workshop we agreed on the study period, data collection, the necessary support and the feedback workshop.

During the field-testing period it became obvious that Western Cape/ Red Cross Children's Hospital and Limpopo/ Elim could not establish U5PIP-sites.

The second U5PIP workshop was held in Kempton Park on 22/4/04. Data were presented from eight sites. They included the paediatric wards in the following hospitals: Kalafong (Gauteng province), Metsimaholo-Sasolburg (Free State), Witbank (Mpumalanga), Kimberley (Northern Cape), Edendale, Grey's, Northdale (all in Pietermaritzburg, KwaZulu-Natal) and the following hospitals in Mafikeng region (North-West Province): Lehurutshe, Zeerust, Mafikeng provincial, Thusong and Gelukspan.

This second workshop had the following outcomes:

- All sites want to continue with the U5PIP
- New sites want to join (Middleburg, Scottburgh)
- Paediatric nurses and provincial MCH-coordinators were interested to join the process and the workshops
- The support from the provincial and the National Departments of Health was encouraging
- More funding would be needed for the expanding activities and for the new software and manual
- This paediatric mortality audit should be extended to all paediatric age groups
- Specific analyses should be available for infants and for under-5 children
- A list of necessary changes and improvements to the U5PIP software was started and further developed over the following 3 months (see below)
- The name of the new Programme would be Child Healthcare Problem Identification Programme (Child PIP)
- Main problems identified were HIV / AIDS and malnutrition, and the new Child PIP should give baseline and trend information for both
- Modifiable factors gave important health management information. They show, where more resources are urgently needed, and how present resources may be used more effectively.
- A report on the field-testing and the findings from the sites should be written and printed

*Key-requirements of the new Child PIP*

- To collect monthly statistics of paediatric services, data on deaths occurring within the health services and on children, who are dead on arrival
- To provide case fatality rates
- To give more detail on nutritional classification and HIV-classification of deaths, PMTCT and to link these to causes of death
- To give the most common causes of death and most common modifiable factors
- To give information regarding modifiable factors present in children, who die of common causes of death (LRTI, Diarrhoeal disease, Sepsis, AIDS, Severe Malnutrition)
- To amalgamate data from different sites

The third U5PIP workshop was held in Kempton Park in October 2004. Data was presented from ten sites: Kalafong, Metsimaholo-Sasolburg, Witbank, Kimberley, Scottburgh (KZN), Middleburg (Mpumalanga), Edendale, Grey's, Northdale (all 3 in Pietermaritzburg) and the five hospitals in Mafikeng region. The combined data of the 1-year period 1/9/03-31/8/04 are presented in this report in chapters 1 and 3.

Representatives of the National Dept of Health, Child and Adolescent Health directorate attended all three workshops. During the third workshop new developments in the Child PIP software were presented and new sites were identified in all provinces. All sites will start using the new Child PIP on 1st January 2005.

The main outcomes of the third U5PIP workshop were the *recommendations* of the Child PIP group, which are included in this report as chapter 2.

*Findings from the Field-testing in the eight sites*

1. The paediatric ward registers are not accurate concerning the discharge diagnosis and age of the child. The child's weight category should be added, stating if the child is above or below the 3rd centile of weight for age. This was implemented in most sites during the field-testing.
2. Both weighing, weight recording and weight analysis improved in the study hospitals
3. Patient records were often of poor quality, which makes audits ineffective. It needs continuous inputs to improve this.
4. The RTH-chart or other notes on pre-hospital care must be available, so that PHC can be analyzed

*Audit meetings and the audit process*
The reports from the different sites show that most cases were audited in audit meetings. The meetings took place daily, weekly, every fortnight or monthly, depending on the patient load. One to 14 cases were discussed per meeting; the duration of the meetings varied between 1/2 and 2.5 hours. Between 1 and 9 doctors and 1-10 nurses attended the meetings. However, six of the eight sites reported poor attendance of doctors and health managers at audit meetings or lacking support of health managers for the audit process.

Attendance from PHC-level was difficult to establish in all sites. If we do not have health workers from PHC attending the audit meetings, the programme will not have the necessary impact on primary care.

In some hospitals very few audit meeting were held due to staff shortages. The U5PIP was then used for file-reviews of children who died. This is not ideal, but all these cases were included in this report. Health managers must clearly point out their commitment towards U5PIP and make audit meeting attendance a priority for doctors and nurses involved in paediatric care.

## Discussion

This field-testing was done with the regular health workers (nurses, doctors, health managers). They were trained to use the audit system, to identify and analyse their own problems in service delivery and to prioritise interventions. To prepare cases for the audit and to attend audit meetings should be part of their normal duties. Thus the only additional costs for this audit were the two workshops to train the users and to give feedback, the travelling, software and user-manuals.

The audit is an internal assessment system for hospital paediatric care. It gives health workers a baseline of outcomes and problems in the institutions, where they work. As it is an ongoing audit, the effectiveness of interventions implemented can be monitored.

The following problems need attention in audit-implementation:

- Staff shortage leads to poor attendance at audit meetings during times and in health facilities, where quality improvement is most needed.
- Audit meetings and audit processes need full support from the hospital and district management teams
- Most of the sites reported poor documentation of patient care. Substandard care and modifiable factors can only be identified if record keeping is improved.

- It remains a challenge to ensure adequate attendance from the district; only if this succeeds, the audit will have an impact on primary healthcare.

Where audit meetings were held, they were usually well prepared by the doctor working in the paediatric ward and the sister in charge. Nurses and doctors attending audit meetings participated actively and found the process educative. Both managers and health workers appreciated that it is important to review deaths and that the information gained is crucial for quality improvement.

It was not possible to establish regular audit meetings in all hospitals. Even if a few doctors only do case-reviews, we feel that this is much better than not auditing the deaths at all. But we do recommend that all hospitals using U5PIP aim at establishing regular audit meetings, where nurses and doctors from the hospital and from the districts are present. These meetings need careful preparation; monthly admission data should be presented as well. Relevant health managers need to receive regular feedback, so that they can implement necessary changes in healthcare delivery.

The present U5PIP-database has a number of deficiencies, which became obvious during the field-testing, e.g. monthly admission data can not be entered and the reports generated are very limited and do not allow for independent analysis of different underlying conditions, like HIV-status, underweight and specific causes of death. All the comments and experiences have been noted, and the development of a new improved database is in an advanced stage. It was also requested by the users that the audit be extended to children up to the age of 18 years. The name of the new paediatric mortality audit will thus be: Child healthcare Problem Identification Programme (Child PIP).

When starting mortality audits in a hospital the initial finding may be that many files are lost, not all deaths are identified, there are discrepancies between different registers (casualty, wards, mortuary) and that the documentation of patient care is very poor. This makes audits ineffective and may lead to underestimation of deficiencies and modifiable factors in healthcare. As we continue to use the audit as an assessment tool, it will show if the feedback from audit meetings is sufficient to improve record keeping or if other interventions are needed. Initially the number of deaths may seem to rise, but the fact may be that only now all deaths are identified and analysed. When analysing Modifiable factors the guiding principle is that what has not been written has not been done. The fact that all deaths are audited may be an encouragement for clinical personnel to improve record keeping.

Using the U5PIP lead to a number of positive interventions in study hospitals:

- The weighing of children and weight analysis improved
- In-service training was conducted for doctors and nurses on paediatric HIV-infection, severe malnutrition management, pneumonia and paediatric TB case-management, especially on oxygen therapy, monitoring of respiratory distress, antibiotics, feeding and intravenous fluid management
- New charts for fluid intake were tested by nurses and doctors and were introduced with lectures on fluid management in dehydration and shock

In summary, the main problem-areas identified in implementing this audit were lack of accurate ward registers and patient records to evaluate care, staff shortages leading to poor attendance at audit meetings and deficient communication between hospitals and health workers at primary care level in the districts. Four sites also reported lack of buy-in concerning audit processes, although clinical audits are officially a high priority in today's South African health system. Successful audit implementation needs wholehearted support from hospital general managers, clinical managers and the relevant directors in the provincial health departments.

The following strengths of the U5PIP audit system were noted:

- Concrete cases, where the implementation of an achievable improvement (e.g. weighing all admitted children and analysing their weights) could make a difference, were strong motivators when discussing problems with health managers.
- All sites using the U5PIP want to carry on with the audit and new sites have indicated their interest to join.
- The existing staff in paediatric wards can implement the U5PIP. District hospitals may need the support of a visiting paediatrician or a family physician to facilitate audit processes.

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# List of abbreviations and terminology

| | Definitions / examples |
|---|---|
| ART | Anti-retroviral treatment |
| Case fatality rate (CFR) | Number of deaths in a specific age group during a specific time period divided by number of admissions in the same age group and time period. Can be calculated also for specific disease categories |
| Case-management | Drug treatment and non-drug treatment, intravenous fluids, feeding, communication with the caregiver and follow-up |
| Child PIP | Child healthcare problem identification programme = the improved version of the U5PIP, which will cover all paediatric patients and is presently being developed |
| Clinic nurse | Nurse employed by the district, working in a peripheral clinic |
| Clinical personnel | Nurses and doctors |
| CSD | Community service doctor |
| EDP | Essential Drug Programme |
| IMCI | Integrated management of childhood illness |
| IV fluids | Intravenous fluids |
| Health worker | Doctors, nurses, paramedical health workers |
| GE | Gastro enteritis |
| IMCI | Integrated management of childhood illness (a WHO training and implementation programme for paediatric primary care) |
| IMR | Infant mortality rate |
| KMC | Kangaroo mother care |
| LRTI | Lower respiratory tract infection, pneumonia |
| MCH | Maternal and Child Health |
| Modifiable factors | Events, actions, omissions contributing to the death of a child or to substandard care in a child, who died |
| MPH | Mafikeng provincial hospital |
| NGO | Non-governmental organization |
| NG tube | Naso-gastric tube |
| OPD | Out patient department |
| PCP | Pneumocystis carinii pneumonia |
| PCR | Polymerase chain reaction blood test |
| PHC | Primary health care |
| PMTCT | Prevention of mother to child transmission of HIV |
| QI | Quality improvement |
| PPIP | Perinatal problem identification programme |
| Road-to-health chart (RTHC) | Under-5 chart, patient retained record of the child's weights, immunizations and health problems |
| Severe malnutrition | Marasmus, Kwashiorkor or marasmic kwashiorkor |
| STG | Standard treatment guidelines |
| Under-5 audit meetings (U5AM) | Regular audit meetings with all health workers involved, to discuss under-5 deaths that have occurred in health institutions |
| U5PIP | Under-5 care problem identification programme |
| Underweight | Below the 3rd centile for weight for age, according to the Wellcome classification |
| VCT | Counselling and voluntary testing (for HIV) |

**Social problems and Caregiver- / family-related modifiable factors**

| | Definitions / examples |
|---|---|
| Delay in seeking care | A time of more than 3 times the time normally required to reach the clinic/ doctor / hospital |
| Caregiver did not realize the severity of the illness | E.g. in a child with convulsions |
| Infrequent clinic attendance | Less than half of the recommended visits |
| Orphan | A child who's mother or both parents have died |
| Poverty | Total family income of less than 400R in a household of 3 and less that 600R in a household of 4 or more people |

**Administrative modifiable factors**

| | Definitions / examples |
|---|---|
| Communication problem Staff-staff | E.g. doctor did not communicate a change in prescription to a nurse |
| Lack of accessibility | More than 90 minutes walking distance to the clinic; clinic open only 8-16h00 on weekdays |

**Medical personnel modifiable factors**

| | Definitions / examples |
|---|---|
| No team decision on palliative care | Children with progressive, incurable terminal disease with a limited life expectancy, who were known to the paediatric staff, and where a team decision for palliative care (pain treatment, symptomatic treatment, holistic psychosocial and spiritual support) could have been made with the caregiver and the paediatric team, but was not taken |
| Response to antibiotic therapy | Clear improvement in the clinical condition (pyrexia, pulse rate, at least partial resolution of clinical signs) within 48-72 hrs, as judged by the attending medical officer |

## Appendix 1: Additional Data – Amalgamated U5PIP Data from eight sites Sept 2003 to Aug 2004

| | EDH | NDH | GH | Total PMB | Maf Reg | Kim | Mets | Kal | Wit | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **Total number of medical U-5 admissions** | 2811 | 2702 | 677 | 6190 | 4389 | 2400 | 841 | 3927 | 1948 | **19695** |
| Total number of Under-5 admissions for LRTI | 960 | 899 | 176 | 2035 | 1314 | | | 1114 | 693 | **5156** |
| Total number of Under-5 admissions for G.E. | 690 | 993 | 74 | 1757 | 850 | | | 821 | 411 | **3839** |
| Total sev malnutr adm (marasmus, Kwashi) | 217 | 60 | 34 | 311 | 398 | | | 154 | 94 | **957** |
| **Total number of medical Under-5 deaths** | **415** | **200** | **79** | **694** | **356** | **173** | **50** | **134** | **125** | **1532** |
| Total number of Under-5 deaths normal weight | 105 | 60 | 23 | 188 | 73 | 62 | 11 | 45 | 47 | **426** |
| Total number of Under-5 deaths <3rd centile | 236 | 132 | 50 | 418 | 258 | 105 | 31 | 84 | 65 | **961** |
| Total number of Under-5 deaths weight not known | 74 | 8 | 6 | 88 | 25 | 8 | 8 | 5 | 13 | **147** |
| Total no. of Under-5 deaths LRTI normal weight | 41 | 28 | 2 | 71 | 26 | | 8 | 10 | 30 | **145** |
| Total no. of Under-5 deaths LRTI <3rd centile | 82 | 32 | 7 | 121 | 68 | | 16 | 19 | 27 | **251** |
| Total no. of Under-5 deaths LRTI weight not known | 20 | 2 | 1 | 23 | 3 | | 18 | 32 | 0 | **76** |
| Total no. of Under-5 deaths G.E. normal weight | | 14 | 0 | 14 | 6 | | 0 | 1 | 0 | **21** |
| Total no. of Under-5 deaths G.E <3rd centile | | 44 | 2 | 46 | 32 | | 4 | 6 | 0 | **88** |
| Total no. of Under-5 deaths G.E. weight not known | 72 | 4 | 1 | 77 | 3 | | 10 | 23 | 7 | **120** |
| Total no. of Under-5 deaths with sev malnutrition | 114 | 55 | 18 | 187 | 99 | 46 | 17 | 38 | 36 | **423** |
| U5-deaths occur in young infants (1- 12 mths) | 265 | 138 | 46 | 449 | 238 | 107 | 40 | 84 | 93 | **1011** |
| HIV-related Under-5-deaths | 237 | 146 | 41 | 424 | 194 | 83 | 29 | 92 | 101 | **923** |
| U5-deaths occurring in the first 24 hrs of adm | 146 | 65 | 16 | 227 | 92 | 51 | 13 | 32 | 45 | **460** |

| Main Causes of Death | EDH | NDH | GH | Total PMB | Maf Reg | Kim | Mets | Kal | Wit | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of deaths caused by: LRTI | 139 | 62 | 10 | 211 | 97 | 53 | 27 | 56 | 57 | **501** |
| Gastroenteritis / Shock | 72 | 55 | 3 | 130 | 41 | 22 | 10 | 16 | 7 | **226** |
| Sepsis | 34 | 15 | 16 | 65 | 52 | 33 | 4 | 22 | 10 | **186** |
| AIDS | 16 | 35 | 9 | 60 | 55 | 20 | 4 | 7 | 12 | **158** |
| All TB | 9 | 1 | 6 | 16 | 15 | 4 | 0 | 3 | 3 | **41** |
| **Other, associated causes of death** | | | | | | | | | | |
| Severe Malnutrition | 95 | 50 | 12 | 157 | 90 | 46 | 10 | 38 | 30 | **371** |
| LRTI | 84 | 79 | 30 | 193 | 45 | 31 | 11 | 9 | 26 | **315** |
| Sepsis | 51 | 13 | 6 | 70 | 86 | 25 | 2 | 23 | 23 | **229** |
| Gastroenteritis / Shock | 43 | 37 | 12 | 92 | 48 | 26 | 10 | 19 | 9 | **204** |
| AIDS | 49 | 1 | 0 | 50 | 0 | 0 | 5 | 44 | 15 | **114** |
| all TB | 22 | 17 | 7 | 46 | 32 | 12 | 3 | 13 | 8 | **114** |
| **AIDS and HIV related deaths** | | | | | | | | | | |
| No. of deaths caused by AIDS | 62 | 36 | 9 | 107 | 55 | 20 | 12 | 50 | 27 | **271** |
| Symptomatic HIV infect, no test | 23 | 58 | 4 | 85 | 71 | 7 | 17 | 7 | 11 | **198** |
| Symptomatic HIV infect, Elisa pos | 152 | 52 | 28 | 232 | 68 | 56 | 0 | 25 | 63 | **444** |

| **Social (NB:** lack of info in 15-80% of cases**)** | **EDH** | **NDH** | **GH** | **Tot PMB** | **Maf Reg** | **Kim** | **Mets** | **Kal** | **Wit** | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of deaths with Mother chronically ill | 32 | 15 | 11 | 58 | 83 | 24 | 2 | 8 | 9 | **184** |
| Mother died/ orphan | 18 | 7 | 7 | 32 | 20 | 8 | 1 | 3 | 10 | **74** |
| **Modifiable factors** | | | | | | | | | | |
| **Lack of info** | | | | | | | | | | |
| No. of deaths with no RTHC/ no info pre-hosp care | 77 | 1 | 14 | 92 | 162 | 15 | 10 | 4 | 6 | **289** |
| insufficient notes to comment | 70 | 0 | 13 | 83 | 75 | 3 | 17 | 12 | 6 | **196** |
| case not audited | 0 | 0 | 0 | 0 | 23 | 8 | 0 | 0 | 0 | **31** |
| file lost | 49 | 0 | 2 | 51 | 19 | 0 | 0 | 10 | 0 | **80** |
| **Caregiver / Family related Modifiable factors** | | | | | | | | | | |
| No. of deaths with delay in seeking care | 101 | 55 | 16 | 172 | 57 | 34 | 6 | 9 | 10 | **288** |
| infrequent clinic attendance | 21 | 2 | 3 | 26 | 12 | 10 | 1 | 6 | 1 | **56** |
| Caregiver did not realize severity of illness | 71 | 15 | 15 | 101 | 8 | 10 | 7 | 10 | 10 | **146** |
| declining HIV test | 5 | 9 | 1 | 15 | 25 | 22 | 4 | 8 | 5 | **79** |
| other Modifiable factor | 15 | 3 | 6 | 24 | 8 | 25 | 5 | 6 | 7 | **75** |
| no info | 110 | 2 | 8 | 120 | 141 | 4 | 28 | 18 | 4 | **315** |

| Modifiable factors - Administrative | EDH | NDH | GH | Tot PMB | Maf Reg | Kim | Mets | Kal | Wit | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of entries: lack of equipment | 10 | 0 | 2 | 12 | 10 | 2 | 5 | 3 | 0 | **32** |
| lack of facility / access | 6 | 2 | 1 | 9 | 38 | 4 | 3 | 5 | 2 | **61** |
| transport problems | 21 | 1 | 4 | 26 | 10 | 2 | 2 | 0 | 1 | **41** |
| communication problems staff-staff, staff-caregiver | 29 | 0 | 3 | 32 | 29 | 0 | 4 | 2 | 3 | **70** |
| lack of medicines, blood prod, IV-fluids | 29 | 0 | 11 | 40 | 13 | 3 | 2 | 6 | 3 | **67** |
| lack of milk/ food | 2 | 0 | 0 | 2 | 22 | 1 | 0 | 0 | 0 | **25** |
| lack of personnel | 17 | 1 | 4 | 22 | 44 | 0 | 1 | 0 | 3 | **70** |

| Modifiable factors clinical personnel - PHC level | EDH | NDH | GH | Tot PMB | Maf Reg | Kim | Mets | Kal | Wit | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **Number of entries**: insufficient case assessment | 35 | 1 | 6 | 42 | 50 | 11 | 5 | 3 | 6 | **117** |
| insufficient case monitoring | 26 | 0 | 0 | 26 | 22 | 1 | 3 | 0 | 0 | **52** |
| insufficient case management | 33 | 0 | 5 | 38 | 37 | 8 | 8 | 4 | 10 | **105** |
| Inappropriate use of RTHC | 24 | 0 | 2 | 26 | 7 | 2 | 21 | 0 | 0 | **56** |
| delay in referring -acute | 9 | 0 | 3 | 12 | 18 | 4 | 14 | 4 | 2 | **54** |
| delay in referring -chronic | 14 | 0 | 2 | 16 | 47 | 3 | 1 | 0 | 1 | **68** |
| lack of info | 92 | 0 | 8 | 100 | 162 | 16 | 7 | 4 | 3 | **292** |
| **MF - Clinical personnel - Hospital A and E care** | | | | | | | | | | |
| Number of entries: insufficient case assessment | 289 | 1 | 27 | 317 | 155 | 5 | 98 | 8 | 4 | **587** |
| insufficient case monitoring | 106 | 0 | 1 | 107 | 90 | 1 | 21 | 0 | 3 | **222** |
| insufficient case management | 50 | 1 | 7 | 58 | 175 | 15 | 16 | 3 | 2 | **269** |
| **MF-Clinical personnel - Hospital Routine care** | | | | | | | | | | |
| Number of entries: insufficient case assessment | 209 | 0 | 10 | 219 | 44 | 8 | 52 | 4 | 3 | **330** |
| insufficient case monitoring | 99 | 1 | 6 | 106 | 29 | 24 | 18 | 5 | 2 | **184** |
| insufficient case management | 70 | 1 | 6 | 77 | 27 | 36 | 5 | 4 | 4 | **153** |
| **MF-Clin pers - any level of care in hospital** | | | | | | | | | | |
| Problems with IV fluids (prescribing/ given/ recorded) | 118 | 2 | 4 | 124 | 89 | 1 | 5 | 8 | 3 | **230** |
| Inadequate feeding (prescribing/ given/ recorded) | 35 | 0 | 1 | 26 | 39 | 3 | 0 | 2 | 0 | **70** |
| Delay in consulting | 24 | 0 | 2 | 26 | 3 | 4 | 2 | 2 | 1 | **38** |
| Delay in referring | 5 | 0 | 10 | 15 | 2 | 2 | 4 | 2 | 1 | **26** |
| Problems with previous admission/ OPD | 36 | 2 | 2 | 40 | 12 | 0 | 0 | 4 | 1 | **57** |

EDH – Edendale Hospital, NDH – Northdale Hospital, GH – Grey's Hospital, PMB – Pietermaritzburg (3 sites); Maf reg – Mafikeng Region; Kim – Kimberley; Mets – Metsimaholo-Sasolburg ; Kal – Kalafong; Wit – Witbank.

## Appendix 2

| Child PIP - Causes of Death, Diagnoses and Underlying Conditions 9/04 | | | |
|---|---|---|---|
| **Please note**: The nutritional category/ **malnutrition** and the clinical and laboratory classifications concerning **HIV** do not appear here. They have to be captured in the relevant fields on the data sheet. | | | |
| **Category** | **Causes of Death** | Code | **ICD 10 classification** |
| **Infections and Parasitic Diseases** | Acute diarrhea, hypovolemic shock | 101 | A02 A04 A05 A08 A09 |
| | Chronic diarrhea | 102 | A07, K 52.9 |
| | Dysentery | 103 | A03 A06 |
| | Pulmonary Tuberculosis | 110 | A15 A16 |
| | TB Meningitis | 111 | A17 |
| | Miliary, other extra pulmonary TB | 112 | A18 A19 B90 |
| | Septicemia, possible serious bacterial inf | 120 | A01 A40-41 A48-49 B95 |
| | Cong. Infections (not HIV) | 130 | A50 B00 B25 P35 |
| | Meningitis, bacterial | 140 | A39 G00 G03 |
| | Viral, meningo encephalitis | 141 | A85-89 G04 |
| | Other inflamm dis of CNS (eg abscess) | 142 | G06 G08-09 |
| | Measles | 150 | B05 |
| | Other possible serious viral infection | 151 | B00-02 B25 |
| | AIDS | 160 | B20-24 |
| | Malaria | 170 | B50, B53 |
| | Hospital acquired infection | 180 | |
| | | | |
| **Oncology, Haematology** | Tumors, Leukaemias | 201 | C22 C48-49 C64 C81-96 |
| | Anaemia | 202 | |
| | Other (specify) | 203 | |
| | | | |
| **Endocr, Nutritional, Metabol.** | IDDM, DKA | 301 | |
| | Hypoglycemia | 304 | E15 |
| | Other (specify) | 305 | |
| | | | |
| **Dis of the Nervous System** | Status epilepticus | 401 | G41 |
| | Other (specify) | 402 | |
| | | | |

| | | | |
|---|---|---|---|
| **Dis of the Circulatory System** | RHD, Rheumatic fever | 501 | I01 I05-09 |
| | Heart failure, Pulmonary Edema | 502 | I50 J81 |
| | Myocarditis | 503 | I40 |
| | Cong. Heart disease, Cardio myopathy | 504 | I42 Q20-28 |
| | Endocarditis | 505 | I33 I38 |
| | Other (specify) | 506 | |
| | | | |
| **Dis of the Respiratory Syst** | Croup | 601 | J05 |
| | Pneumonia, LRTI | 602 | J12-18 J21-22 |
| | PCP (suspected or confirmed) | 603 | |
| | Pneumothorax, Pyothorax, Pleural effusion | 604 | J86 J90 J93 |
| | Asthma | 605 | J45-46 |
| | Cong malformations of the resp. system | 606 | Q30-34 |
| | other respiratory failure (specify) | 607 | J96 |
| | | | |
| **Dis of the Digestive System** | Cirrhosis, portal hypertension, liver failure, hepatitis | 701 | B15-19 K72 |
| | Surgical (Appendix, hernia, intestines, peritoneum) | 702 | K35-46, K55-K66 |
| | Other (specify) | 703 | |
| | | | |
| **Category** | **Causes of Death** | **Code** | **ICD 10 classification** |
| **Diseases of the Genitour Syst** | Acute nephritic | 801 | N00-01 |
| | Acute renal failure | 802 | N17 |
| | Chronic renal disease | 803 | N03-05 N18-19 |
| | Other (specify) | 804 | |
| | | | |
| **Ill-defined /unknown cause** | Ill-defined/ unknown causes of mortality | 900 | R95-99 |
| | | | |
| **Other diagnosis** | Other diagnosis (specify) | 901 | |
| | | | |
| **Burns** | Burns | 1000 | T20-32 |
| | | | |

| | | | |
|---|---|---|---|
| **Poisonings** | Paraffin | 1101 | X46 |
| | Corrosives | 1102 | T54 |
| | Other (specify) | 1103 | T36-52 55-65 X40-45, 47-49 |
| **Bites and Stings**, toxic plants | Bites and Stings, toxic plants | 1200 | W50-64 X20-29 |
| | | | |
| **Inhalation** of for. body or gastric cont | Inhal. of foreign body or gastric content | 1300 | T17 W78-80 |
| | | | |
| Transport related **accidents** | Transport related accidents | 1400 | V01-V99 |
| Other accidents (incl. Drowning) | Other accidents (incl. Drowning; specify) | 1500 | |
| | | | |
| **Non accidental injury, abuse** | Non accid injury, abuse related, neglect | 1600 | Y04-06 |
| | | | |
| **Homicide** | Homicide | 1700 | X85-Y05, Y07-09 |
| **Suicide** | Suicide | 1800 | X60-X84 |
| | | | |
| | | | |
| ***Underlying Conditions – Children at Risk*** | | | |
| | | **Code** | |
| | cerebral palsy | 1 | G80 |
| | hydrocephalus | 2 | G91 |
| | Other congenital / inherited abnormalities | 3 | |
| | ex-low-birth-weight infant | 4 | |
| | twin / multiple pregnancy | 5 | |
| | Other (specify) | 10 | |
| | | | |

# Appendix 3

| Child PIP - Modifiable Factors with Codes 9/04 | | |
|---|---|---|
| **Caregiver / Family related Modifiable factors** | | |
| **Sub-Category** | Code | Description |
| **Timing** | F101 | Infrequent clinic attendance |
| | F102 | Delay in seeking care |
| **Recognition** | F103 | Caregiver did not realize severity of illness |
| | F104 | Caregiver refusing treatment |
| | F105 | Home treatment with negative effect on the child, eg. Enema |
| **Immunisations** | F106 | Never immunised/ behind with immunisations |
| **Nutrition** | F107 | Inappropriate nutrition |
| **RTH Card** | F108 | Not present / referral letter lost |
| **Consents / Returns** | F109 | Declining HIV test |
| | F110 | Did not arrive on day of referral / did not keep appointment |
| **Other** | F189 | Other modifiable factor concerning caregiver / family (specify) |
| **Insufficient info** | F190 | Insufficient information / notes on caregiver / family care |

| Clinical Personnel related modifiable factors - at Clinic / CHC level | | |
|---|---|---|
| **Insufficient case assessment** | P301 | For acute respiratory infection |
| | P302 | IMCI not used for pt assessment |
| | P304 | Insuff assessment for failure to thrive |
| | P309 | Other insuff assessment (specify) |
| **Insuff monitoring** | P311 | No weight / other inappropriate use of RTHC |
| | P312 | O2 saturation (at Community Health Centre) |
| | P319 | Other insufficient monitoring (specify) |
| **Insufficient case-management** | P321 | No appropriate stat antibiotics /antibiotics for acute infection |
| | P322 | No TB contact treatment |
| | P323 | Insufficient fluid management for Gastro enteritis with dehydration |
| | P324 | Insufficient investigations done |
| | P325 | IMCI not used for case-management |
| | | |
| **Delay in referring - acute** | P331 | Delay in referring acute respiratory infection |
| | P332 | Delay in referring gastro enteritis with dehydration |
| | P333 | Delay in referring other acute problem (specify) |
| **Delay in referring - chronic** | P341 | Delay in referring failure to thrive |
| | P342 | Delay in referring chronic cough |
| | P343 | Delay in referring chronic diarrhoea |
| | | |
| **Other** | P379 | Other modifiable factor - clinical personnel at clinic level (specify) |
| Inappr care by **GP** | P380 | Inappropriate care / late referral by GP |
| **Insufficient info** | P390 | Insufficient information/ notes on care at clinic level |
| | | |

| | | |
|---|---|---|
| **Administrative Modifiable factors - at Clinic / CHC level** | | |
| **Lack of Transport** | C211 | Home- Institution |
| | C213 | Clinic / CHC to hospital |
| **Lack of Access** | C222 | Lack of clinic / limited opening times |
| | C224 | Lack of high care beds / resuscitation area |
| Barriers | C227 | Barriers to entry to healthcare |
| **Lack of Personnel** | C231 | Lack of prof nurse at clinic |
| | C239 | Other lack of personnel (specify) |
| **Communication** | C241 | Communication problems: Staff - caregiver: at clinic |
| | C249 | Staff - staff communication problem at clinic or between clinic / hospital |
| | | |
| **Administrative Modifiable factors - at Clinic / CHC level contd.** | | |
| **Lack of Drugs, IV etc** | C254 | Oxygen supply / equipment |
| | C255 | Antibiotics |
| | C256 | Other lack of drugs, IV fluids (specify) |
| **Laboratory** | C258 | Basic laboratory investigation not available, e.g. Blood glucose |
| **Lack of equipment** | C261 | Pulse oxymeter (at CHC) |
| | C262 | Suction |
| | C263 | Lack of other equipment (specify) |
| **Lack of Policy** | C271 | Concerning short-stay for paeds patients at health care center |
| | C279 | Other lack of protocol / policy (specify) |
| **Insufficient info** | C290 | Insufficient notes on administrative problems at Clinic / CHC level |
| | | |

| Clinical personnel - Hospital Admission and Emergency care | | |
|---|---|---|
| **Insuff case assessment** | P401 | History taking incomplete |
| | P402 | Physical examination incomplete |
| | P403 | Resp rate not taken, resp distress not noticed |
| | P404 | Assessment of shock / dehydration insufficient |
| | P405 | Appropriate investigations not done (blood, x-ray, other) |
| | P406 | Results of investigations not noted |
| | P407 | Not classified as critically ill by nurse / danger signs not noticed |
| | P409 | Other insuff case assess (specify) |
| | | |
| **Insuff monitoring** | P411 | Respiratory rate |
| | P412 | O2 saturation |
| | P413 | Blood glucose |
| | P414 | Shock |
| | P415 | Level of consciousness, convulsions |
| | P419 | Other insuff monitoring (specify) |
| | | |
| **Insufficient case Mx** | P421 | Shock not treated appropriately / eg. intraosseus line |
| | P422 | Airway obstruction not managed appropriately |
| | P423 | Appropriate O2 therapy not prescribed / not recorded / not given |
| | P424 | Convulsions not managed appropriately |
| | P425 | Appropriate antibiotics not prescribed |
| | P426 | Other insufficient case management (specify) |
| **Insufficient info** | P490 | Insufficient notes on Clinical personnel care at Hosp A and E level |
| | | |

| | | |
|---|---|---|
| **Administrative MF - Hospital Admission and Emergency care** | | |
| **Lack of Transport** | A211 | Home- Institution |
| | A214 | Hospital to referral hospital / institution to institution |
| **Lack of Access** | A223 | Lack of hospital beds/ ward overcrowded |
| | A224 | Lack of high care beds / resuscitation area |
| | A225 | Lack of infant / paediatric ICU facilities |
| Barriers | A227 | Barriers to entry to healthcare |
| **Lack of Personnel** | A232 | Lack of prof nurse at hospital (specify : day / night / week end) |
| | A233 | Lack of senior doctors (post Com Service) |
| | A239 | Other lack of personnel (specify) |
| **Communication** | A242 | Staff-caregiver: at hospital |
| | A243 | Doctor not called for critically ill child |
| | A245 | Doctor to doctor: eg. No hand over of critically ill patient |
| | A246 | Doctor called, but did not respond / did not come |
| | A249 | Other staff-staff communication problem (specify) |
| | | |
| **Administrative MF - Hospital Admission and Emergency care contd.** | | |
| **Lack of Drugs, IV etc** | A254 | Oxygen supply / equipment |
| | A255 | Antibiotics |
| | A256 | Other lack of drugs, IV fluids (specify) |
| | A257 | Lack of blood products |
| **Laboratory** | A258 | Basic laboratory investigation not available |
| **Lack of equipment** | A261 | Pulse oxymeter |
| | A262 | Suction |
| | A263 | Lack of other equipment (specify) |
| **Lack of Policy** | A273 | Lack of case management protocol |
| | A279 | Other lack of protocol / policy (specify) |
| **Insufficient info** | A290 | Insufficient notes on administrative MFs at Hospital A and E care |
| | | |

| Clinical personnel MFs - Hospital - Care in the ward | | |
|---|---|---|
| **Insuff case assessment** | P501 | Physical examination incomplete |
| | P502 | Appropriate investigations not done |
| | P504 | Results of investigations not traced / not noted (incl x-rays) |
| | P507 | LRTI not responding to treatment, not reassessed |
| | P508 | Other condition not responding to treatment, not reassessed |
| | P509 | Patient not seen during week-end/ public holiday |
| | P510 | Insufficient case assessment / Mx at **previous admission / OPD visit** |
| **Insufficient monitoring** | P521 | Respiratory rate / O2 saturation |
| | P523 | Blood glucose |
| | P524 | Shock |
| | P525 | Level of consciousness, convulsions |
| | P526 | Electrolytes |
| | P529 | Other insuff monitoring (specify) |
| | | |
| **Insufficient case-Mx** | P531 | Appropriate O2 therapy not prescribed or not recorded / not given |
| | P532 | Convulsions not managed appropriately |
| | P533 | Appropriate change / addition of antibiotics / TB-Rx not prescribed |
| | P534 | Appropriate blood product not prescribed |
| | P535 | Other appropriate treatment not prescribed (specify) |
| | P536 | Other case management protocol not followed (specify) |
| | P537 | No team decision for **palliative care** |
| | P538 | Prescribed treatment not given |
| **Delay in calling for senior opinion** | P601 | Com Serv Dr / Intern did not call senior Medical Officer |
| | P602 | MO at peripheral hospital did not call provincial hospital / referral hosp |
| | P603 | Other delay in calling for senior opinion |
| **Delay in referring** | P611 | To provincial hospital / referral hospital for coma / CT scan |
| | P612 | To provincial hospital / referral hospital for other problem |
| | P613 | Other delay in referring |
| | | |

| | | |
|---|---|---|
| **IV fluids / intake-output** | P621 | No prescription for IV fluids |
| | P622 | IV fluids not monitored / not recorded appropriately |
| | P623 | Too much / too little / incorrect type of IV fluids prescribed / given |
| | P624 | No appropriate intake-output charting done |
| **Feeding/ NG tube** | P631 | NG tube feedings not prescribed |
| | P632 | NG tube feedings not recorded / given |
| | P633 | Other appropriate feedings not recorded / not given |
| | P634 | Problems with NG tube feedings (like cough, cyanosis) |
| **Other** | P689 | Other modifiable factor - clinical personnel - hospital ward |
| **Insufficient info** | P690 | Insufficient notes on Clinical personnel MFs in Hospital ward(s) |
| | | |

| Administrative modifiable factors - Hospital - Care in the ward | | |
|---|---|---|
| **Lack of Transport** | W214 | Hospital to referral hospital |
| **Lack of Access** | W223 | Lack of hospital beds/ ward overcrowded |
| | W224 | Lack of high care beds / resuscitation area |
| | W225 | Lack of infant / paediatric ICU facilities |
| | | |
| **Lack of Personnel** | W232 | Lack of prof nurse at hospital (specify:day / night / week end) |
| | W233 | Lack of senior doctors (post Com Service) |
| | W239 | Other lack of personnel (specify) |
| **Communication** | W242 | Staff-caregiver: at hospital |
| | W243 | Doctor not called for critically ill child |
| | W245 | Doctor to doctor: eg. No hand over of critically ill patient |
| | W246 | Doctor called, but did not respond / did not come |
| | W249 | Other staff - staff communication problem (specify) |
| | | |
| **Lack of Drugs, IV etc** | W254 | Oxygen supply / equipment |
| | W255 | Antibiotics |
| | W256 | Other lack of drugs, IV fluids (specify) |
| | W257 | Lack of blood products |
| **Laboratory** | W258 | Basic laboratory investigation not available |
| | | |
| **Lack of equipment** | W261 | Pulse oxymeter |
| | W262 | Suction |
| | W263 | Lack of other equipment (specify) |
| **Lack of food / milk** | W269 | Lack of food / milk |
| **Lack of Policy** | W272 | At hospital: on weekend / holiday ward rounds |
| | W273 | Lack of case management protocol |
| | W279 | Other lack of protocol / policy (specify) |
| **Insufficient info** | W290 | Insufficient notes on administrative problems, hospital inpatient care |

Hospital: _____ Ward: _____

## Appendix 4

Deaths Register Number: _____

## Child PIP: Child Death Data Capture Sheet

Child PIP Computer ID: _____

**Patient**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Name:** | | | | **From** (nearest town): | | | |
| **Folder no:** | | **DOB (yy/mm/dd)** | | **Age** | (pc calculates) | **Gender** | □ / □ |
| **DoA** | | *ToA* | | **When death occurred:** | Weekday (07:00-19:00) | Weekend/ Public holiday | |
| *DoD* | | **ToD** | | Dead on Arrival | Weeknight (19:00-07:00) | | |

**Records**

| | | |
|---|---|---|
| File not available | File present, records incomplete, e.g. no RTH card | File present, notes inadequate (quality of notes is poor) |

**Referred**

| | | | | | |
|---|---|---|---|---|---|
| | Name of hospital/clinic | | | | |
| □/□ | If yes: | Another hospital | A clinic | Unknown | Private sector |
| | If yes: | Inside drainage area | Outside drainage area | Unknown | |

**Ward Type**

| | | | | | | |
|---|---|---|---|---|---|---|
| General paediatric / mixed medical and surgical | POPD/Casualty | ICU | High care | Paeds medical | Paediatric surgical | Other |

**Social**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mother** | Alive and well | Dead | Sick | Unknown | **Primary Caregiver** | Mother | Grandmother |
| **Father** | Alive and well | Dead | Sick | Unknown | | Father | Other (state): _____ |

**Nutrition (fill in weight and tick one other box)**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Weight:** | _____kg | OWFA | Normal | UWFA | Marasmus | Kwashiorkor | M-K | Unknown |

**HIV / AIDS**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Lab** | Negative | Exposed | Infected | No result | Not tested | Unknown |
| **Clinical** | Asymptomatic | Stage I | Stage II | Stage III | Unknown | |
| **PMTCT** | Yes | No | Unknown | | | |
| **Feeding** | Exclusive breast | Exclusive formula | Mixed | Unknown | | |
| **ARV** | Yes | No | Unknown | | | |

**Cause of Death**

| | | | | |
|---|---|---|---|---|
| **Main Cause of Death:** | | | **Underlying condition:** | |
| Other important Diagnoses (max 4) | | | | |

**Modifiable factors**

| | Code | Family/ Caregiver/ Home | | Comments | | Code | A / E contd. | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| **NB: if notes are *inadequate,* please enter the relevant code for each section** | | Probable | Possible/ ? | | Modifiable Factors: Contd. | | Probable | Possible/ ? | |
| | | Probable | Possible/ ? | | | | Probable | Possible/ ? | |
| | | Probable | Possible/ ? | | | | Probable | Possible/ ? | |
| | | **Clinic/Ambulatory Care** | | | | | Probable | Possible/ ? | |
| | | Probable | Possible/ ? | | | | *Hospital: Ward* | | |
| | | Probable | Possible/ ? | | | | Probable | Possible/ ? | |
| | | Probable | Possible/ ? | | | | Probable | Possible/ ? | |
| | | Probable | Possible/ ? | | | | Probable | Possible/ ? | |
| | | Probable | Possible/ ? | | | | Probable | Possible/ ? | |
| | | **Hospital: A&E** | | | | | Probable | Possible/ ? | |
| | | Probable | Possible/ ? | | | | Probable | Possible/ ? | |

**Appendix 5**

Hospital: _____

Year: _____

# Monthly Tally Sheet

Month: _____

Ward: _____

**Ward Type**

| General paediatric / mixed medical and surgical | ICU | High Care | POPD/Casualty | Paeds medical | Paediatric surgical | Other |
|---|---|---|---|---|---|---|
| | | | | | | |

| | | Admissions | Discharges | Deaths | Case fatality rates |
|---|---|---|---|---|---|
| **Age** | ≥1month - <1yr | | | | |
| | ≥1yr - < 2yrs | | | | |
| | ≥ 2yrs - < 5 yrs | | | | |
| | ≥ 5yrs - < 13 yrs | | | | |
| | ≥ 13 yrs - 18 yrs | | | | |
| | **Totals** | | | | |
| **Complete information below for children <u>≤ 5years only</u>** | | | | | |
| **Weight** | Above or on 3rd centile | | | | |
| | Below 3rd centile | | | | |
| | Unknown | | | | |
| | **Totals** | | | | |
| **Illness** | Acute lower respiratory infections | | | | |
| | Diarrhoeal disease | | | | |
| | Other | | | | |
| | **Total** | | | | |

Notes:

1. Include all children admitted older than one month, to your institution's paediatric/paediatric surgical / children's service. "Paeds general" = medical and surgical mixed
2. Include all "deaths on arrival" (applies mainly to POPD/Casualty)
3. Children under one month should be entered under PPIP (perinatal audit)
4. Discharges column includes referrals out
5. Case fatality rates (CFR) should be calculated for each group and each month
6. The formula is: CFR = $\frac{deaths}{admissions} X\ 100$

Compiled by:_____(Name) _____(sign)

Date: _____ Fax/ Tel number:_____